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Steel and Concrete on Midway

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Among Our Writers

GEORGE K. LEONARD (U. of Nebr., B.Sc. C.E. '12, C.E. '39) has been connected with construction for 30 years. Prior to 1933 he was contracting engr. and general construction supt. for Woods Bros. Const. Co. Since that time he has been with TVA as Construction Engr. on Wheeler, Guntersville, Watts Bar and Cherokee dams; and Project Manager of Hiwassee Projects, including Apalachia, Ocoee, Chatuge, and Nottely dams.

HENDON R. JOHNSTON (U. of Tenn., B.S. C.E. '32), following work with the U.S. Engineer Corps on rivers and harbors, joined the staff of the TVA in 1933, and spent 6 years principally on field investigations of dam foundations. Since 1939 he has been in charge of construction of navigation channels on the Tennessee River.

JOHN C. BUCHANAN (Bliss Electrical School '24; U. of Tenn.) worked mainly on the design and construction of industrial electric power installations for contracting companies until in 1933 he became connected with the TVA. He is now Electrical Engr. of the Construction Plant Div.

WILLIAM J. RAUE is a Carpenter's Mate, First Class, U.S.N.R. As a member of a Seabee battalion, he saw extensive service in the Aleutians; later was assigned to duty as an overseas correspondent for the Seabees in the Pacific Area. Before enlisting in the Navy, he was a correspondent for the Milwaukee (Wis.) *Journal*.

L. S. WESCOTT (Villanova Col., B.S. in C.E. '25) has worked for contractors in the heavy construction field for 20 years, since 1934 with the Harrison Construction Co. of Pittsburgh, on highways, bridges, heavy foundations, sewers, and water supply. The past 5 years he has worked chiefly on construction of rolling mills and other plants for the Aluminum Co. of America.

E. W. LANE (Purdue U. and Cornell U.) at present Prof. of Hydraulic Engineering at the State U. of Iowa, has been engaged in hydraulic developments on the Miami, Arkansas, St. Lawrence, Missisippi, Susquehanna, Colorado, Columbia, and Tennessee rivers in this country, and the Yangtze and Huai in China.

J. DOUGLAS LEE (Queen's U., B.Sc. in C.E. '40; Iowa, M.S. in Hydr. and San. Eng. '42) is at present Asst. Prof. in Civil Engineering at Queen's U., Kingston, Ontario, Canada. Summer work includes consulting work in hydraulics, Asst. and Dist. Engr. in Dept. of National Health, and work with the Ontario Dept. of Highways.

D. B. STEINMAN (College of the City of New York, B.S.; Columbia U., A.M., C.E., Ph.D.), consulting engineer and authority on long-span bridges, has carried out professional engagements on five continents. Five of his bridges have received awards or honors in the annual contests for artistic bridges conducted by the American Institute of Steel Construction.

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Volume 15 December 1945 Number 12

Lightning Strikes on the Job

Causes of Some Fatal Accidents on Construction Projects Analyzed

CONSIDERED in every construction contract are the unforeseen but dreaded "Acts of God." Such freak occurrences, though uncommon, have caused considerable damage and loss of life. Perhaps the most unpredictable is lightning damage. Well worn but often disproved is the old saw, "Lightning never strikes twice in the same place." In this symposium accidents in two locations, one an exposed river bed and the other far underground in a tunnel heading, are analyzed and helpful conclusions as to causes are drawn. Obviously, it is not possible to protect against unpredictable hazards. Nevertheless, as is pointed out by the authors, many precautions can be taken in defense against lightning which are not now common practice. These papers were presented before a meeting of the Knoxville Sub-Section of the Tennessee Valley Section and subsequently printed in the "Tennessee Valley Engineer."

In Apalachia Tunnel

By George K. Leonard, M. ASCE
Chief, Project Planning Division, TVA, Knoxville, Tenn.

At 5:29 p.m. on June 4, 1942, a man was killed by lightning in the Apalachia tunnel. A number of reasons were advanced as to the general cause of death and why he should be the only one killed in a compact group of 22 men. His partner on the drifter came very close to the truth when he said, "Something hit him—lightning, electricity, or something." The job investigating committee, which held a hearing on the cause of the accident, probably came nearest to the truth when it called it an "Act of God."

All Safety Precautions Taken

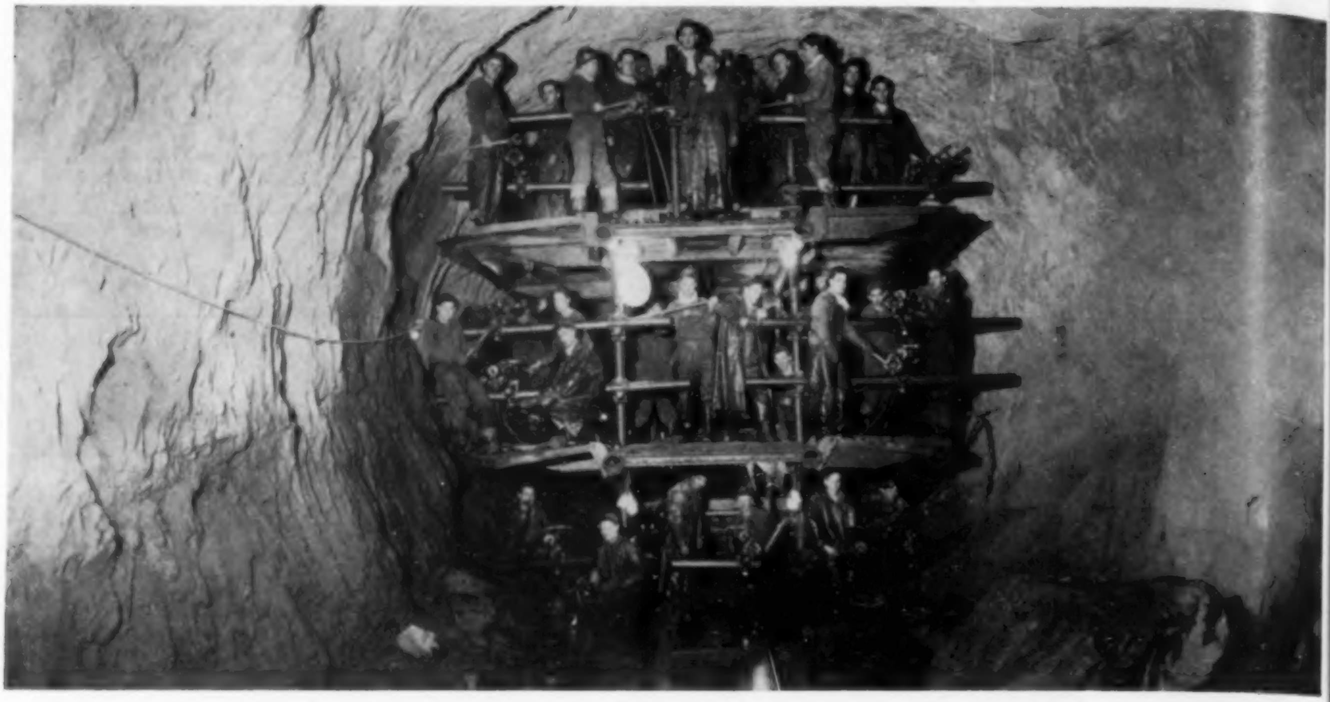
The accident was a very unusual one. None of the older tunnel workmen had heard of a similar occurrence although they had had many years of experience in underground work and had heard during that time all the legends and superstitions of the craft. All the usual orthodox precautions had been taken to circumvent the effect of stray electrical currents. In the past, these had been sufficient to protect the lives of the workmen from lightning, but the lightning that killed Simmie Woody did not enter the tunnel in the orthodox way.

The tunnel in which Woody was working was a part of the Apalachia project, a national defense project started by TVA in July 1941 for rapid construction to augment the power supply for the manufacture of critical material, especially aluminum. The tunnel connects the dam and power house, about 44,000 ft apart. With a finished lined diameter of 18 ft, it was excavated through rock to a minimum diameter of 20 ft. The project was described at length by the writer in Civil Engineering for January 1945.

To permit work along the tunnel at several locations at the same time, four adits were driven into the tunnel line along natural stream channels which divided the total length into five sections. With two portals at each adit and one at the end about 1,000 ft downstream from the dam, nine headings were available for simultaneous attack. Actually, only seven headings were in operation at any one time. No excavation was taken from the portal at the power house end.

The deceased was a 26-year-old chuck-tender working on the swing shift of the drill crew which was driving from the dam-site portal in Section 1. This section was about 7,000 ft long. The drill jumbo, from which the drilling was done, had mountings for 11 drifter drills. This required a crew of 11 miners, 11 chuck-tenders, and three or four other workmen. A full-face heading was being drilled, which required about 65 holes 13 ft long. Steel changes were made every 2 ft, and it was the chuck-tender's duty to help the miner make these changes as rapidly as possible by removing the drill rod from the drill chuck, pulling the rod out of the hole, and inserting the new rod. The drilling round was finished in about $1^1/_2$ hours, and with each driller and tender driving six holes it is evident that there was no time to waste. The din at the face with all 11 drills operating was terrific, and no other sound could be heard.

The all-steel drill jumbo shown in Fig. 1 was made of welded pipe and traveled along the tunnel on a 36-in.-gage track which was bonded and grounded. Compressed air and water for use with the drills were piped to the heading in grounded pipes, and connected to the distribution system on the jumbo with wire-wound rubber hose. The ventilating pipe stopped 100 ft from the face. The 2,300-v power-supply cable sheath and transformer banks were grounded, and only a 110-v lighting circuit was used on the jumbo. Apparently all ordinary,



FRONT OF DRILLING JUMBO AS SEEN FROM THE HEADING

customary precautions had been taken to protect the men at the face from electric currents coming into the tunnel from the adit.

LIGHTNING STRIKES OVER TUNNEL

And yet, at 5:29 p.m. a foreman entering the tunnel saw a lightning bolt apparently strike the mountain above it (although no evidence was found after a careful search), and Sim Woody, working on the jumbo 2,100 ft from the portal, was killed. He was on the middle deck at one side. Just above him on the top deck two other men were knocked unconscious but were resuscitated by the quick and skillful work of O. M. Monferato and his associates. Witnesses reported two flashes about 30 sec apart, the first one only knocking Woody down, the second one electrocuting him. The flash seemed to have the intensity of a shorted light circuit or light bulb. Power supply was not interrupted.

Several other men in the group felt shocks, but McClean, the miner who with Woody was pulling a 9-ft drill steel out of the hole, felt nothing. The steel had been removed from the chuck and was not in contact with the jumbo. The deceased's boots were practically new, with no defects. No burns were discovered on his body, although there were several blue spots which did not appear to be bruises. He was apparently in good physical condition.

The rock at the heading was massive micaceous quartzite made up largely of quartz, feldspar, muscovite and biotite mica. Its composition was: SiO_2, 85%; Al_2O_3, 5%; Fe_2O_3, 2%; K_2O and Na_2O, 3%; CaO, 1.5%; other, 3.5%. The rock type has a high electrical resistance.

It was later discovered that the stroke was felt in the heading being drilled from the other end of the section and which was about 400 ft from the scene of the accident. In this heading a miner was scaling loose rock from the roof, and two scaling bars were leaning against the face. According to an eye witness, "The flash played all around between the two bars . . . and all but wrenched the scaling bar out of the safety miner's hand without him feeling any discomfort from the electrical charge."

A man on the muck dump 3,000 ft away felt a shock, as did another man 22,000 ft farther along the tunnel line.

Dr. K. B. McEachron, Research Engineer, General Electric Company, who studied the testimony and evidence said, "As is always the case, there is some inconsistency in the evidence and it is always hard to know to what degree the evidence can be relied upon and which evidence is to be given the greatest weight. It seems likely, however, based on all the information available, that the lightning discharge did enter Mr. Woody through the rock and the metal bar and passed to ground, either through his feet or some other portion of his body which might have been in contact with the platform on which he was standing. It is quite evident, based on the appearance of his body and the doctor's testimony, that the amount of current was not very great. This seems reasonable in view of the probable resistivity of the rock in which operations were going on."

ABSOLUTE PROTECTION DIFFICULT

Practical remedial measures would be difficult to arrange. To attempt to protect the men from possible lightning at all times would seem to be impractical since an accident of this kind occurs so infrequently, and might almost be classified as a freak accident. To protect them while a storm was actually in progress would be more simple. They could be taken from the tunnel to a place outside, which could be protected from direct lightning strokes or, as Dr. McEachron suggests, they might take refuge in metal cages thoroughly grounded through the frame of a metal car to the rails. In a contrivance of this kind they would be safe if they did not touch the tunnel wall. If the holes have been loaded with dynamite, there is no question about the advisability of withdrawing the men from the face.

Woody might not have been killed had the steel rod which he was pulling from the hole been connected with an electrical conductor to the steel jumbo, assuming of course that the jumbo was grounded to the bonded rails, which in turn were grounded. This would have taken the lightning from the rod to ground through a conductor other than his body.

Fig. 1. Sections Through Apalachia Heading Where Fatal Accident Occurred

Ordinary electrical construction will prevent the possibility of lightning's being conveyed into a tunnel should it strike the rails or other conductors such as pipes on electrical circuits. The rails should be carefully grounded where they enter the tunnel so that the electrical charge from the lightning must exist in a relatively low ground resistance. Pipes should be connected to the rails with good bonds, and the circuits should be connected to the rails through adequate lightning arresters.

Woody's death was untimely. The stroke that killed him, however, could very well have killed several more of his associates, and the fact that it did not is cause for thankfulness. Possibly the lesson learned from this accident will help prevent others, and if this is true Woody's death may not have been in vain.

On River-Channel Excavation

By Hendon R. Johnston

Chief, River Channel Improvement Division, TVA, Knoxville, Tenn.

The Tennessee Valley Authority's navigation program includes the construction and maintenance of a channel 9 ft deep in the Tennessee River from the Ohio River to Knoxville. This necessitates the removal of river-bed materials from the downstream approaches to all the navigation locks. The materials to be moved consist of bedrock, sand, gravel, mud, and snags, the amount of bedrock varying from 15,000 cu yd below Wheeler Dam to 330,500 cu yd below Pickwick Dam.

Hard Rock Requires Blasting

Fragmentation methods must be resorted to, since the rocks in general are of such hardness that they can neither be removed by hydraulic pumping methods nor dug by mechanical excavators while in their natural, or undisturbed state. They range in texture from very soft to very hard, from horizontal to vertical in dip, and from very thin to relatively thick beds with numerous folds, faults, joints, and cavities, and cannot be broken successfully by either the doby (mudcap) or drophammer method. Hence the usual method—drilling and blasting—has been used throughout the program where rocks have been encountered that were hard enough to resist mechanical excavation. See Fig. 2.

Many problems are inherent in rock breakage. Among these are depth and areal spacing of drill holes, amount and kind of explosive, and sure but safe detonation. These problems are particularly difficult in marine work since the rock surface is always obscured by varying depths of water and overburden materials.

Experience in the Tennessee Valley area has shown that the depth and spacing of drill holes and the amount and kind of explosive necessary for effective rock breakage vary somewhat because of the different types of rock encountered in the river bed. It is generally true, however, that holes drilled 4 ft below the required grade elevation, with spacings of 5 ft in both directions and loaded with 1 to 1.5 lb of dynamite per foot of hole, will break the rock so that it can be excavated to grade with the usual type of river-dredging equipment. Steam-powered dipper dredges of 3.5-cu yd capacity have been most generally used, although an 8-cu yd dragline dredge was used on the Guntersville project.

Drilling and charging the holes is done from a barge anchored longitudinally with the stream. Pneumatic drills adapted from the usual wagon-drill type are employed. Drilling is done through a stand pipe or casing driven to the rock surface, and upon completion the drill hole is charged immediately with dynamite through the casing, the cap wires being retrieved as the casing is extracted.

It is not feasible to shoot only a few holes at a time. The time consumed in moving the drillboat away, firing, and moving back into position is costly, and in addition drilling adjacent to a shot area is both time consuming and ineffective, and is quite apt to result in unfractured rock areas. For these reasons the usual pattern of explosive field consists of a maximum of 20 rows of 20 holes each—a total of 400 holes over an area 100 ft square.

A safe method of detonating the explosive field was not considered a serious problem until premature explosions caused by lightning proved it to be very real and very serious. Prior to these accidents, the wiring of the fields followed orthodox plans which had been approved by technicians from leading explosives manufacturing firms. Using standard electric instantaneous exploders with enameled lead wires, the holes in individual rows were wired in series, and rows in turn were wired in parallel to the trunk, or exploding, lines. All connections were made, and bare wires were coated with a water-

DRILL BARGE AND SWEEPING UNIT IN TENNESSEE RIVER CHANNEL

proofing compound as drilling progressed. The trunk lines were left open where they ended on the drillboat. The drillboat was moved a safe distance from the loaded field, which was then fired with current by a 110-v, d-c, gas-driven light plant.

The common safety practice of moving away from the loaded field at the approach of an electrical storm had been adhered to, although this practice is not nearly so simple as in the case of dry-land operations, where the personnel simply walk away from the field.

While using this method, two premature explosions, apparently detonated by rather remote lightning strokes, were experienced in an area downstream from Hales Bar Dam. These two explosions occurred in 1941 and 1942 less than 300 ft apart in areal location, but more than one year apart in time. Fortunately, neither of them resulted in serious injuries to men or serious property damage, since in both cases the drill holes were shallow and contained small charges, and the river bed was overlain by relatively deep water, which absorbed much of the shock.

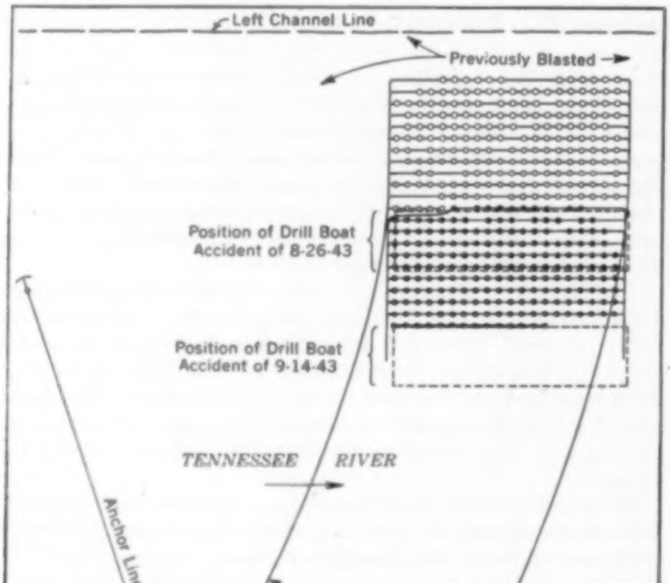


FIG. 2. POSITIONS OF DRILLBOAT AND EXPLOSIVE FIELD ON THE TENNESSEE RIVER

As a result of this experience, a slight change was made in the method of wiring the field. At the suggestion of electrical and explosives technicians, the ends of the two trunk lines remaining on the drillboat were kept connected together and grounded through the boat at all times.

On August 26, 1943, a loaded field was detonated, apparently by a remote lightning stroke, in the Browder Bar section of the Tennessee River, approximately four miles downstream from the Fort Loudoun Dam. In 240 drill holes, 1,960 lb of dynamite had been loaded. The holes were relatively deep and held correspondingly greater charges of dynamite. The water was relatively shallow. This explosion resulted in lost-time injuries to eight workmen, and considerable damage to the drillboat. Damage to life and property was probably lessened by the fact that this drillboat had a steel hull of rather sturdy construction.

On September 14, 1943, a second premature explosion, also apparently caused by lightning, occurred in the same section, only 45 ft distant from the first one (Fig. 2). This time 1,400 lb of dynamite had been loaded in 186 holes, and again the entire field was detonated. This explosion resulted in the death of one workman by drowning, lost-time injuries to nine other workmen, and destruction of the wooden-hulled drillboat.

SEVERAL COINCIDENCES APPARENT

A singular fact common to all four of these accidents is that the premature explosion did not occur during a storm of intense proportions. Work had progressed throughout storms apparently of much greater intensity. Another coincidence is that all four accidents occurred while drilling and blasting in Knox dolomite, while the time spent in drilling this particular group of rock formations totaled only approximately 25% of the drilling time.

Of human interest is the fact that, at the time of the last and most serious explosion, of the fifteen men on the drillboat the one man killed and the nine injured were all standing upright. The other five men aboard were either in sitting or kneeling positions. All injuries suffered from direct impact were to feet and legs, four men suffering fractures of one or both heels.

Characteristics of Lightning Discharges

By John C. Buchanan
Electrical Engineer, Construction Plant Division, TVA, Knoxville, Tenn.

Adit of Apalachia Tunnel in Rock Hillside

LIGHTNING is the visible electrostatic discharge from one cloud to another, from a cloud to the earth, or, what is not generally realized, from the earth to a cloud. Much has been learned about lightning since the development of vacuum tubes, the cathode ray oscillograph, and associated equipment.

Surface Configuration Influences Direction

It has been proved that practically all, if not all, lightning discharges to ordinary terrain originate at the cloud. It is believed that the reason for this lies in the configuration of the terminal electrode. A negative cloud above the earth's surface will attract positive charges in the area on the earth's surface whose size is dependent on the configuration of the sky electrode and the earth's surface. A pointed electrode (as the tower of a high building) projecting up from the earth's surface, concentrates most of the positive charges in this point. This seems to have a controlling influence on the initiation of the discharge.

High-speed photographs were taken during extensive studies conducted by Dr. K. B. McEachron, research engineer of General Electric Company, on the Empire State Building in New York City. These show that lightning travels in a zigzag course through the heavens in a series of steps. It hesitates between each one of the forward steps, and may move a distance of 150 ft in each of its motions toward the earth. (See Fig. 3.)

The results of these experiments permit many of them to be duplicated in the laboratory under controlled conditions. For instance a flat piece of copper 1 in. wide and several inches in length can be crushed into an approximately round conductor by passing about 300,000 amperes through it. This crushing effect is caused by an intense magnetic field set up around the flat strip.

The knowledge gained by these studies is used to develop protective apparatus for transmission lines, motors, generators, and other electrical equipment.

No form of lightning arrester has been developed for man's personal use. As far as is known there are only two safe places for a man to be when lightning strikes. One is inside a metal enclosure or cage. This shield will provide a path of good conductivity for the lightning to travel around his body instead of through it. The other safe place to be is any place other than the locality where the lightning strikes.

There are four ways in which lightning can be a menace to human life:

1. By a direct stroke
2. By electrostatic induction
3. By electromagnetic induction
4. By earth currents

Considerable study has been made of the effect of lightning strokes on airplanes. If a plane flies between two clouds of different potential, a discharge may occur between the clouds through the plane. In every case in which lightning has struck an airplane it has left two holes, one where it entered and one where it left. The stroke does not literally pass through the plane, but merely jumps to one point and is then conducted through the metal to another point where it leaves. The damage is done at the points of entry and departure.

When a current passes through a resistance, a voltage drop or potential difference is developed across the resistor. There is a case on record of a man who was holding a cow by the halter near a tree that was struck by lightning. The cow was killed instantly, but the man was uninjured except for shock. When the lightning struck the tree, heavy earth currents spread out from the roots of the tree in all directions. The resistance of the soil in which these currents were flowing developed a potential drop or a difference in potential between two points on the surface of the ground. The distance between the cow's hind legs and her fore legs provided a voltage high enough to kill her. The man's feet were too

close together to develop an appreciable difference of potential, and he was not hurt. The poor conductivity of the earth at the base of the tree was the cause of this accident. If the tree had been a perfect ground, this accident would not have happened.

APALACHIA TUNNEL ACCIDENT EXPLAINED

The fatal accident described in one of the previous articles, which happened during the construction of the Apalachia tunnel, was the result of a bolt that struck somewhere on top of the mountain above the tunnel operations. As pointed out by Mr. Leonard, this section is largely a formation of quartz rock and according to the geologists is comparatively free of mineral veins, and of

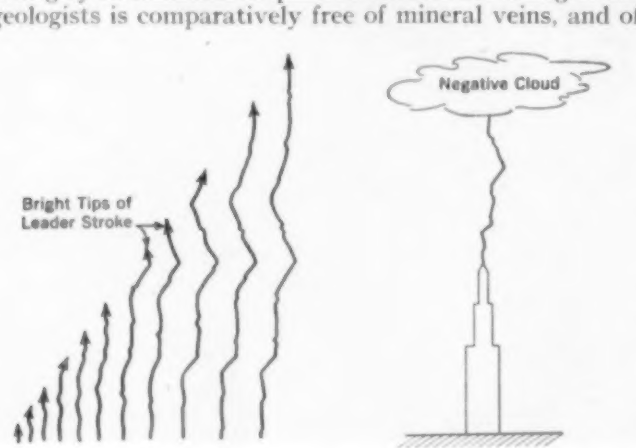


FIG. 3. LIGHTNING STROKE DEVELOPING UPWARD IN STEPS, AS SHOWN BY PHOTOGRAPHS

course is quite high in resistance. It is practically impossible to get a good ground in this area without going to considerable expense in constructing a ground mat.

From all indications, the deceased was standing on a platform of the jumbo trying to dislodge a piece of drill steel. The jumbo was grounded to the track and the track was grounded at the entrance of the tunnel. The rails of the track were bonded. The lightning struck the mountain somewhere above the tunnel and because of the poor conductivity of the earth was not immediately dissipated. It traveled in all directions, as indicated by the fact that men 400 ft away, in the adjacent tunnel, felt the shock. The charge was picked up by the steel bit, passed through the man's body to the jumbo, thence to the track, and on toward the river before finally being dissipated.

If a jumper had been provided from the drill steel to the jumbo, this particular accident might not have happened, but, on the other hand, if a man had had one hand on the jumbo and was in contact with the tunnel heading, these precautions might still have been in vain.

Earth currents were the cause of the workman's being shocked while standing on the muck pile outside the tunnel. Soil conditions of poor conductivity are extremely hazardous to human life when lightning strikes nearby.

CAUSE OF RIVER ACCIDENTS

The other accidents, the premature explosions of loaded areas in the river bottom, described by Mr. Johnston were caused by electromagnetic induction, and earth currents apparently played no important part. The plan of shooting was to lay out an area approximately 45 by 100 ft. The holes were drilled in rows on about 5-ft centers and loaded with dynamite as the drilling progressed. Each row of holes was connected in series, thus making up a pattern of several series. The series were then connected in multiple to No. 14 lead wires leading to the firing switch on the drillboat.

Explosives manufacturers recommend that the chief precaution to be taken against accidents when firing with electricity is to keep the lead wires short-circuited until the moment of connecting them to a source of current. This was done in the operation described. After a study of conditions existing at the time of the explosion, it was apparent that the loop circuit recommended by explosives manufacturers is extremely hazardous.

When magnetic lines of force cut a wire, a voltage is induced in that wire; and when the wire is short-circuited on itself, a current will flow. The induced voltage is proportional to the number of lines of force cutting the wire and is also proportional to the speed of cutting. This is the principle on which all our generators operate. The heavy current that flows in a lightning stroke sets up very strong magnetic fields that may blanket quite large areas. The steepness of the wave front also contributes to the amount of voltage that may be induced. These magnetic lines of force cutting the loop circuit induced sufficient voltage to cause a premature explosion.

A conference was arranged with General Electric and Westinghouse engineers for the purpose of discussing the accident in detail. The Westinghouse engineers were unanimous in agreeing with us that the loop circuit should be avoided, as it was considered to be dangerous from the standpoint of magnetic induction. They made some preliminary studies which indicated that over 100 volts would be induced in a 100-ft loop circuit if a stroke of lightning having a 20,000-ampere per micro-second wave front struck within a radius of 1,000 ft. They recommended the use of two-conductor shielded cable for all connections. The purpose of the shielding is to prevent electrostatic induction as well as to eliminate a potential gradient which might exist in the earth or water because of earth currents. It is thought that these precautions should certainly reduce any possibilities of premature explosions due to lightning.

LOOP CIRCUIT SHOULD BE AVOIDED

Dr. McEachron of the General Electric Company was emphatic in stating that the loop circuit should be avoided and that the best possible protection against premature explosions due to lightning would be the isolation of each individual charge of dynamite and the use of short twisted pair leads. One suggested method was to bring the lead wires from four holes to an anchored buoy, being careful to have the lead wires to each hole open circuited. After the loading is completed, the short lead wires could be connected just prior to shooting. If this method should prove unsatisfactory, Dr. McEachron suggested the use of shielded cable for all connections. Because of war conditions, however, it is very difficult to obtain shielded cable, and twisted pair conductors without shielding have been used.

As has been explained, there are four ways in which lightning can be a menace to man. Since the characteristics of each one are entirely different, it is possible to protect against one condition and at the same time set up an ideal condition for one of the other three. To protect properly against all four conditions may not be economical, or may not even be possible.

It should be realized that an approaching storm frequently creates as much electrical disturbance as one in progress. If a thunderstorm threatens while the holes are being loaded, it is suggested that operations be stopped and the entire personnel be removed to a safe distance. This is the only practical way to secure safety from lightning.

Midway Tank Farm

By William J. Raue

Carpenter's Mate 1st Class, Overseas Correspondent, Attached to Naval Construction Battalion

Japan might well have written her own ticket to clear sailing in the Mid-Pacific had she successfully finished a job started in 1942—the Battle of Midway. Instead, this lonely coral island was developed by the United States Navy into a war-expanded submarine base that made possible, in the next two years, a good share of the under-water thrusts that sent Nipponese craft to the bottom or hurrying back to safer home waters.

Tremendous quantities of oil were needed to maintain the submarine warfare and, in April of 1943, Seabees of the 50th Naval Construction Battalion began building a diesel and fuel-oil storage and distribution system to supplement the existing—but inadequate—facilities. Roughly, the project had three main divisions: a diesel oil system, a fuel oil system, and a distribution system which included all piping, valves, pumping stations, and dock facilities. For protection against aerial and surface attack and for camouflage purposes, everything went underground. Even the tanks themselves were covered with dredged coral fill.

The diesel-oil storage system as planned originally was to consist of four 13,500-bbl tanks. These were to hold the oil used by submarines and smaller surface craft powered by diesel engines. Fuel-oil tanks, wherein would be stored heavy bunker oil—the kind used for firing boilers—were of 27,000-bbl capacity.

Both diesel-oil and fuel-oil tanks were similar in design—with the exception that heating elements were provided in the latter. All tanks were built on 15-in. heavily reinforced concrete bases respectively 88 ft and 100 ft in diameter. Steel dowels and T-sections were embedded in the concrete to permit bonding of the steel deck of the tanks with the concrete base. As the tank tops were 9-in. reinforced-concrete slabs, poured over 1/4-in. steel plate, and the entire tank was covered with coral sand to a depth rendering it bombproof, considerable interior structural bracing was used to cope with external pressure. This was supplied by a system of heavy steel columns, beams, and T-ribs welded to form a huge skeleton against which was fitted the "skin" of the tank.

Even under ordinary circumstances the construction of such a fuel system would have its expected construction difficulties. Here the logistical problems of war and the time element increased these "headaches," and the Seabees found themselves confronted with certain "side features" and the need for improvisations.

During the early stages of the war—marked on Midway, as elsewhere, by limited docking facilities, a shortage of stevedores, and small, inadequate supply yards—a combination of rushed handling, sorting, and stowage accomplished little toward getting materials where they would be right at hand when construction began. Corrosion of the steel plates from salt air while they were in storage left shop markings indistinguishable. This made assembly of the pieces for cataloging a difficult operation.

Moreover, a number of plates, girts, and beams had been used on other rushed military installations, and replacements or modifications had to be secured from general stock. Portland cement, welding electrodes, structural members, and incidental fittings were at one time or another on the shortage list of urgently needed materials. Innovations, particularly in heavy flanged fittings, became an everyday occurrence. It was not alone the difficulty of expediting the flow of materials that was responsible for occasional slowdowns. Sometimes it was the problem of unloading cargo ships.

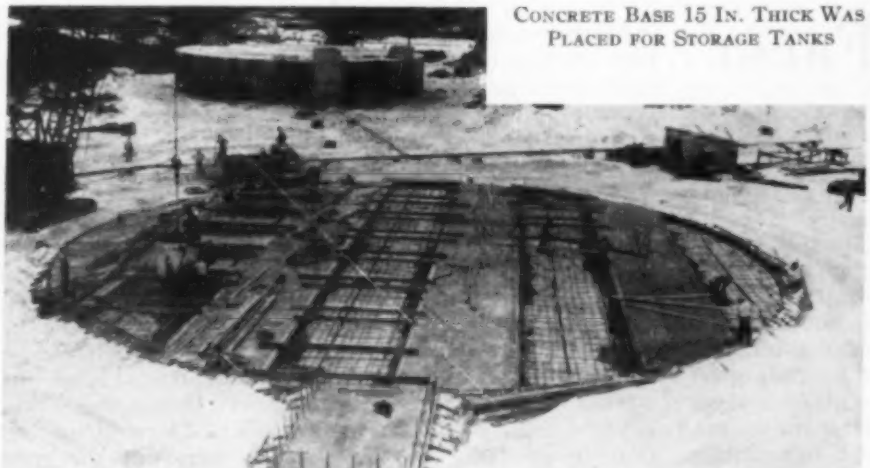
Transportation of material to the job site was complicated by the presence of loose coral sand, which offered little traction. Athey wagons, stone boats, and six-wheel-drive trucks were used, but even then it was sometimes necessary to lay access roads of Marston mat to provide adequate traction. These were not the only headaches encountered. Despite its No. 1 priority status, the project was not without handicaps.

Four welding machines were available when construction began, and this number was increased to 12 at the peak of the work. However, the battalion complement did not include a sufficient number of experienced welding operators for three-shift operation. New men had to be trained on the job to get full benefit of all available welding machines. Within a reasonable time the welding crews were brought up to standard in both ability and manpower, but as the months wore on, the machines (a few had seen considerable previous service) began to show signs of weakness and the need for unobtainable replacement parts, particularly for ignition systems. Ignition difficulties were increased by rainy periods and a general damp condition along the waterfront.

While construction of the tanks was under way, work on the concrete underground pumphouses, and the pipe lines of the distribution system, was carried on simultaneously. Mechanical installations in the diesel-oil pumphouse included two 700-gpm centrifugal pumps, operated under an 85-ft head, and powered by 64-hp diesel engines. Because the oil for the diesel engines of submarines must be especially free of impurities, five 225-bbl per hr clarifiers also went into the pumphouse. To provide air for the diesel engines and to remove the tremendous amount of heat generated by their operation, forced-draft ventilation was provided.

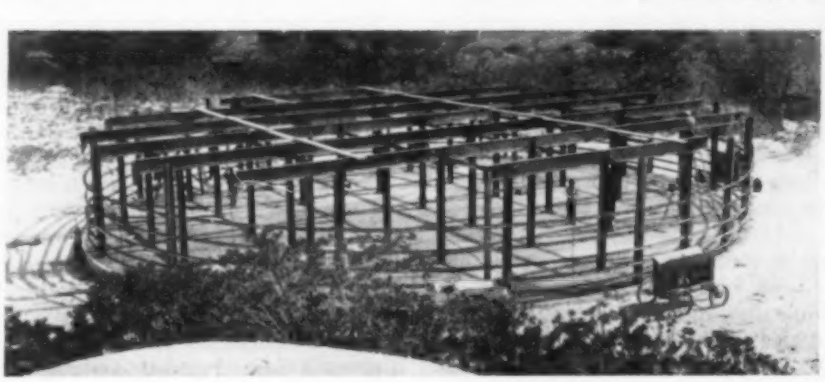
In the fuel-oil pumphouse were installed three 700-gpm rotary pumps operating under a 750-ft head each, with power furnished by a 135-hp diesel engine. The ventilat-

Three Stages of Construction on the Tank Farm



CONCRETE BASE 15 IN. THICK WAS PLACED FOR STORAGE TANKS

ing system was similar to that used in the diesel pumphouse. The original above-ground pumping station afforded additional pumping facilities for the new system.



STEEL SKELETON OF TANK SUPPORTED CONCRETE AND CORAL PROTECTIVE COVER

In view of the inexperience of some of the welders and the speed of construction maintained even during bad weather, testing of the storage tanks and distribution system for leaks assumed considerable importance. From the start it was necessary to guard against leaks, the later repair of which would require emptying the tanks of their explosive and inflammable contents and sweetening the air before any repair welding could be done. The delay resulting from an undue number of leaks, when storage facilities were so urgently needed, might be reflected in a slowdown of American submarine warfare.

A rigid schedule of constant inspection was set up. It was not so much a case of "if" the tanks leaked, as of "where" they leaked. All tanks and pipe lines were tested using either compressed air or water or both. Tank bottoms were first tested by injecting compressed air between the bottom plates and the concrete base, the outer edge of the bottom being sealed to the concrete base with cement grout and hot asphalt. A soap wash was applied to all weld joints. Leaks were detected by bubbles. Later, these same bottoms received a similar air test using a few inches of water instead of a soap wash.

Side joints were tested by applying a jet of compressed air along one side of the weld seam and a soap wash on the other. Finally, all tanks were completely filled with water and observed for several days with the bottom seal broken.

Diurnal ambient temperature changes during assembly of the steel tank bottoms set up significant stresses in the plug welds attaching the tanks to the concrete foundations. On a few occasions, these welds were sprung to such an extent that, while no leaks were in evidence during the air tests, the filling of the tanks with liquid would apparently place enough pressure on areas adjacent to the plug welds to cause minor leaks. The tanks would then be emptied and an air test again applied to locate the leaks.

When tank and pipe-line construction had reached the stage where it was possible to throw up a coral ring-dike around the entire field and begin filling the area with dredge fill, it was necessary to ballast those tanks not already containing oil with water. Every effort was made to keep the dredge operating continuously but there were a few occasions when dredging had to be diverted so that a tank, emptied of its contents by oil-hungry submarines, could be ballasted with salt water supplied through manholes or connecting pipe lines by auxiliary fire pumpers. If a tanker arrived at just the right time, empty tanks were ballasted with oil instead of water. In any case, constant manipulation was required until the fill had risen to the indicated bombproof depth above the tanks and there was no longer any danger that the tanks would float off their con-

A DIKE WAS THROWN UP AROUND COMPLETED TANKS AND A HYDRAULIC FILL PUMPED IN

crete bases. Thus, particular concern was given to any slight movement of tanks which would result in leakage of the bottom plates. Bitumen enamel was used in painting the exterior surfaces of the tanks before they were covered with fill. All mill scale and rust were removed by sandblasting and abrasive wheels.

It might be noted that lost-time accidents were relatively few considering the hazards and the speed maintained throughout the job.

Planning for the future—even during the rush of war—has given Midway a tank farm and distribution system that can overcome practically any diesel or fuel-oil storage problem that may arise in the postwar years. Should the demand for diesel oil increase, a simple manipulation of valves will cut out tanks now being used for fuel oil and transfer them over into diesel storage. That, plus the fact that the entire new installation is permanent, leaves Midway well fixed for oil.

Heavy Grading Required for Airport at Charleston, W. Va.

By L. S. Wescott

Assistant Chief Engineer, Harrison Construction Company, Pittsburgh, Pa.

"RUGGED" is indeed the word most suited to both the terrain and the job involved on Kanawha Airport. To land a commercial plane, a larger flat spot was needed than could be found anywhere near Charleston. The only solution to the problem was to slice off the tops of some of the peaks of Coonskin Ridge and fill in the valleys. The operation involves nearly 10 million cu yd of mixed excavation. One fill alone reaches 230 ft from toe of slope to surface of runway. When finished, this six-million-dollar field will bring commercial airlines in for the first time since 1942 to serve Charleston's population of 150,000. Rapid progress is being made.

Kanawha Airport is being built to serve the need for air transport of the metropolitan area around Charleston, W. Va., the county seat of Kanawha County as well as the state capital. The area contains one of the largest concentrations of chemical industries in the country, is a center for the southern West Virginia coal, oil and gas fields, and has a population of more than a hundred and fifty thousand.

Commercial airlines have been unable to land at Charleston since May 1942 when Wertz Field, the old airport, was turned over to the government for the site of a war plant required by the synthetic rubber program. Wertz Field was six miles northwest of Charleston on the Kanawha River at the base of the surrounding hills, and adjacent to a number of manufacturing plants.

The shortcomings of such a field were realized as long ago as 1934, when the search for a new airport site began. Since comparatively level areas are found only in the river bottoms, such areas had long before been preempted for municipal development and industrial plants. Sites as far away as thirty miles were studied. Construction costs, property damages, and lack of accessibility eliminated site after site until a survey in a locality known as Coonskin Ridge, three miles by air line from downtown Charleston and 400 ft higher in elevation, provided the final answer.

FINANCING A COOPERATIVE UNDERTAKING

Since the rough terrain of this part of West Virginia makes airport construction a most expensive undertaking, the financing of the project has been marked by the cooperation of nearly every governmental unit. The city of Charleston developed the first plan for Kanawha Airport. The state aided the survey and is constructing a new access highway. The county government purchased 743 acres of land from general funds, and through a peoples' bond issue of three million dollars, voted in 1943, provided funds for a thorough study by consulting engineers and for the construction of sufficient facilities to begin operations. It was planned that through operating revenues, funds would be obtained to complete the construction at a later date. However, the passage of P.L. 61 by the 79th Congress permitted the Federal Government to assist such airport work as this, and resulted in an appropriation of $2,750,000, to be administered by the Civil Aeronautics Authority of the Department of Commerce.

The first contract, for the clearing of a major part of the site, was let by the Kanawha County Court in the summer of 1944. This was substantially completed at the time contractors were examining the site preparatory to bidding on the second contract, which consisted principally of 5.2 million cu yd of unclassified excavation.

Contract No. 2, let by Kanawha County Court in September 1944, provided for the grading of 4,500 ft of Runway No. 1, for 3,700 ft of Runway No. 2, and for part of the administration area (see Fig. 1). Contract No. 3, let by the Civil Aeronautics Authority in August 1945, provides for the extension to ultimate length of Runways Nos. 1 and 2 and the administration area, and the construction of Runway No. 3. Both grading contracts were obtained by the same contractor, Harrision Construction Company of Pittsburgh, Pa. Contracts for surface drainage, paving, the administration building, hangars, lighting system, and other appurtenant facilities will be let at later dates.

A SIX-THOUSAND-FOOT RUNWAY

Runway No. 1, the prevailing-wind runway, is planned to be 6,000 ft in length. Runway No. 2 will be 5,200 ft long. Runway No. 3, which will be 5,800 ft long, will be an instrument runway and is laid out 00° 52′ west of true north. All runways will be paved to a width of 150 ft, using a base of native stone and a wearing surface of bituminous concrete. The maximum grade will

On the Job Nearly Every Type of Hauling Equipment Is Employed

For This Mixed Rock and Clay, Tractors and Wagons Were Used

BEDDING PLANES OF ROCK FAVORED HORIZONTAL DRILLING

approximate 1.15% on Runway No. 1. Taxiways, administration and hangar areas, are shown on the contour plan, Fig. 1. Requirements of the Civil Aeronautics Administration are met in all design work.

Underground water has not posed any large problem, since the steep slopes and horizontal sandstone strata of the hills permit little or no accumulation of surface or underground water.

Both grading contracts have the same specifications. Earth fill is placed in 8-in. layers and rolled with approved sheepsfoot rollers. Rock fills may be placed in 24-in. layers; and 10-ton, three-wheel rollers are required for compaction. Benching is required under fills on original ground having slopes steeper than 1 on 3. The problem of grading is resolved into cutting down the tops of four hills and filling the intervening valleys, as shown in Fig. 1.

The total yardage on both contracts is slightly over 9.7 million cu yd. The depth and quantities of both cuts and fills are unusual. The largest fill in the mid-section of Runway No. 1 contains 2.7 million cu yd and has a maximum vertical height of 230 ft from toe of slope to top of runway. Since the highest point in the cut section is El. 1,150 and the toe of the fill mentioned is at El. 700, there is an extreme range of 450 ft in elevation, which provides a grueling test for excavating equipment.

Grading operations began in October 1944. Benches were constructed on most of the fill sections, and drainage in these benches was provided by open-joint terra cotta pipe and coarse aggregate fill. Benches, which varied in width from 18 to 60 ft, were filled with rock varying in volume from 1 to 6 cu yd in order to secure the toe of the slopes. On the largest fill, this type of rock fill over benched section attains a maximum height of 8 ft.

The use of explosives is required for nearly half of the grading quantities. A large range of hardness exists between the various nearly-horizontal strata of sandstone and shale. Alternating layers of shale and sandstone make a considerable portion of the rock-removal work ideal for the use of horizontal drilling. Horizontal self-feeding drills carry holes 6 in. in diameter through shale as far as 60 ft under the harder overlying layers of sandstone.

Blasting is done by the use of $4^{1}/_{2}$-in. cartridges of 40% dynamite 16 in. long. Usually the holes are not filled solid with dynamite, but paper bags filled with dry, fine shale or other inert material are interspersed with dynamite cartridges. The fragmentation produced by such drilling and blasting has been very good. This system has also been economical in the use of dynamite. Another important feature of this method is the lessening of damage from flying rock. Secondary blasting on fills is eliminated by means of drop-weights or "headache balls" operated from a fleet of truck-mounted cranes. Rock and shale are reduced to maximum dimensions without danger or interruptions to surrounding fill operations.

The management of a grading operation as spectacular as this called for considerable planning. This was divided into two phases—operations of earth moving and maintenance of machinery.

When Contract No. 2 was let, the only access by automobile was by a steep, narrow road starting at the southwest corner of the county property. Easier gradients were required to move 52 carloads of equipment and necessary supplies to the work site in a period of four weeks. The permanent state highway connecting with the present concrete road was not scheduled to start until the summer of 1945, so a mile of 20-ft construction access road, stabilized with native stone, was built by the contractor. This access road begins at Etowah siding on the Baltimore and Ohio railroad and winds to the location

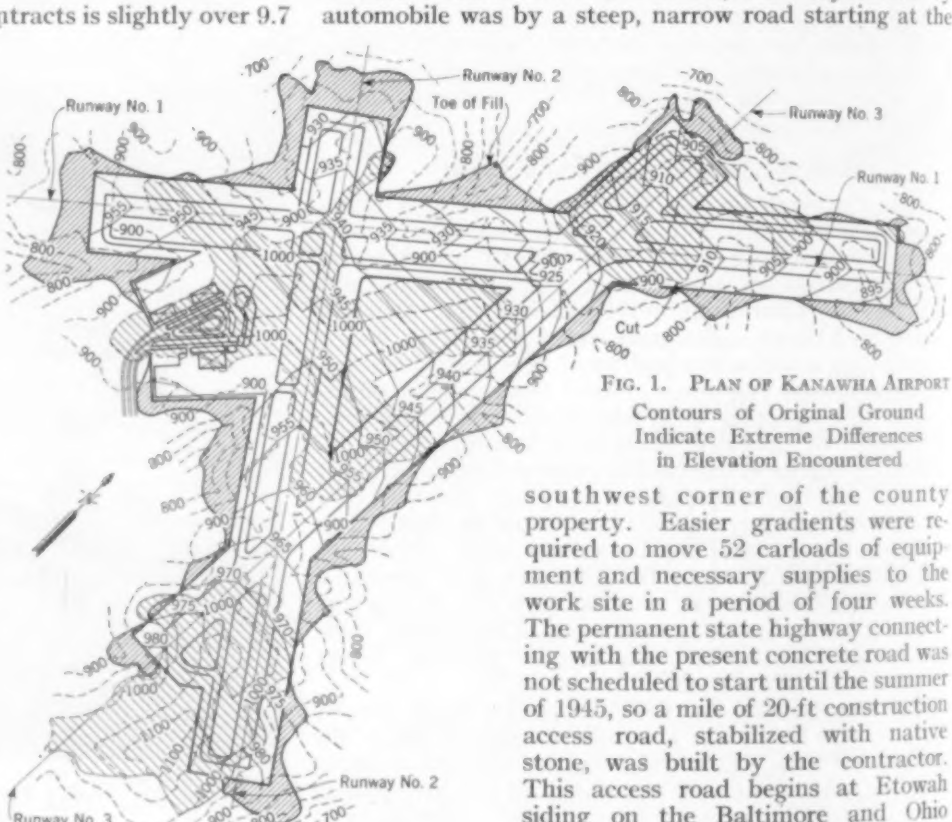


FIG. 1. PLAN OF KANAWHA AIRPORT
Contours of Original Ground Indicate Extreme Differences in Elevation Encountered

Haulage Roads for Scrapers Were Carefully Maintained Throughout Grading Operations

chosen for the shop area, north of the intersection of Runways Nos. 1 and 2.

Haulage roads were divided into two groups, primary and secondary, the former to be used over a period of months and the latter for a few weeks. Grades on the secondary haulage roads are as steep as 35%, while those on the primary roads average nearly 15%.

Types of Equipment

Types of excavation encountered called for nearly every type of equipment used in grading operations except the elevating grader. A fleet of nineteen 12-cu yd, four 22-cu yd, and six 25-cu yd tractor-drawn scrapers and eight Tournapull units is employed for the earthwork. Shovels of 2 and $2^1/_2$-cu yd capacity are used on rock with eighteen 12-cu yd end-dump trucks, three 25-cu yd side-dump trucks, and six tractor-drawn DW10 wagons. The necessary attendant equipment includes pushdozers, bulldozers, angledozers, cranes, motor graders, sheepsfoot rollers, three-wheel rollers, compressors,

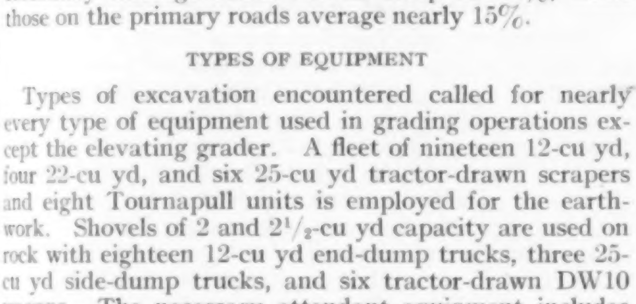


Fig. 2. Benches in Undisturbed Ground Required for Keying Fill to Slopes Exceeding 1 on 3

and service trucks, running the total of such pieces of equipment up to 226 used in grading operations only. As of November 30, Contract No. 2 is 75% complete.

In addition, a rock-crushing plant having a daily capacity of 2,000 tons is in operation to salvage 80,000 tons of rock for use in the base course under the runways.

The task of maintaining and repairing such a quantity of equipment would be difficult under ordinary conditions, but has been more so because of the need of the armed services for heavy construction equipment. Nearly all the equipment in use is more than four years old and has been subjected to hard wear on rush construction of war plants and facilities.

An additional strain is put on the hauling equipment by the steep grades of the project, but it is noteworthy that the average efficiency of all this equipment has increased 65% since the job started. The principal buildings are the tractor shop, truck shop, and parts warehouse. The former are structural-steel-frame buildings with steel trusses and metal siding, 35 by 108 ft, having five-ton traveling cranes. Electric power is obtained from a transmission line which formerly crossed the airport property, but which will be removed when construction operations are finished.

Fuel oil for the project is pumped from a refinery bulk plant along the Elk River to the top of the hill at the shop area. The vertical lift in this line is 350 ft.

The Kanawha County Court is composed of three members, Carl C. Calvert, Mont L. Cavender, and J. G. Carper; its counsel is Dale Casto. The Airport Director, Fred C. Alley, represents the County Court and is responsible for the early planning and location of the airport. Whitman, Requardt and Associates, of Baltimore, Md., are the consultants who developed the master plan. Their engineers in charge of Contract No. 2 are Joseph J. Donohue, M. ASCE; Richard F. Graef, M. ASCE; G. R. Havell, and S. R. Neid.

The New York Office of the Civil Aeronautics Authority is in charge of Contract No. 3 and subsequent construction. R. M. Brown, Assoc. M. ASCE, Chief of the Airways Engineering Section, New York Region, and W. B. Hawkins, Resident Engineer, supervise Contract No. 3. A. H. Hatfield, Assistant Airways Engineer, represents the Washington, D. C., office of the CAA. For the contractor, R. Truzzie, superintendent, is in direct charge of Contracts Nos. 2 and 3, and M. W. Wise is vice-president and general superintendent.

Prototype Verifies Hydraulic Model Tests

Results of Study at University of Iowa, Sponsored by Research Committee of Society's Hydraulics Division

By E. W. LANE, M. ASCE
PROFESSOR OF HYDRAULIC ENGINEERING, UNIVERSITY OF IOWA, IOWA CITY, IOWA

and J. DOUGLAS LEE
ASSISTANT PROFESSOR OF CIVIL ENGINEERING, QUEEN'S UNIVERSITY, KINGSTON, ONTARIO

ENGINEERS have nearly universally adopted the hydraulic laboratory as an important tool in the design of hydraulic structures, and large numbers of projects have been constructed according to designs based on such studies. However, very few actual comparisons have been made of the performance of models and their prototypes. To determine the degree of reliability of such model studies, a subcommittee of the Committee on Hydraulic Research of the American Society of Civil Engineers was organized. As one phase of the project, a comparison was made between the action of models of two stilling basins of the Miami Conservancy District and the conditions observed on the actual structures. This study was completed at the University of Iowa in 1942. The results confirm the reliability of model tests.

The Miami Conservancy District in Ohio was created in 1915 as an agency for securing protection against floods on the Miami River. Many of the problems facing the engineers of the District were entirely new, or of such magnitude and scope that previous engineering experience did not clearly indicate methods of solution. Fortunately an extensive study of the problems was possible, with the result that the structures have been eminently successful.

Perhaps the most difficult question, after the decision had been made to use retarding basins, was the method to be used in dissipating the energy of the water below the dams for the prevention of scour. The result of the investigation was the adoption of a stilling pool of the form shown in an accompanying photograph.

Prototype tests were conducted by the Miami Conservancy District during the years 1922 to 1939. These tests consisted of making stream-flow measurements as a means of calibrating the conduits, and of taking water-surface profiles along the sides of the stilling basins.

The procedure used in determining the discharge was described by C. H. Eiffert, M. ASCE (TRANSACTIONS, ASCE, Vol. 93, page 1585), as follows:

"On this work the latest improved methods, as developed by the United States Geological Survey, are being used throughout. Measurements are made from cableways. Price current meters with 50-lb weights of the new low-resistance shape are used. Meter and weight are suspended by a single $^{1}/_{16}$-inch wire; a small windlass is attached to each end of the cable cars.

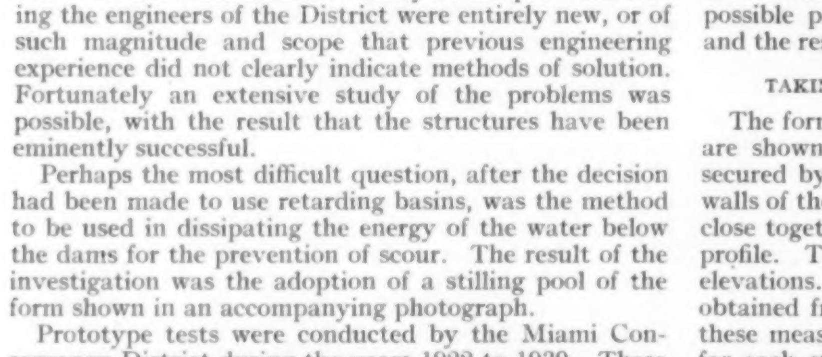
"Two men are required to take all flood measurements. In most cases the use of the heavy weight and small cable eliminates the necessity of making corrections for the vertical angle; such corrections, however, are made where necessary. Current-meter readings are taken at 0.2 and 0.8 of the depth at 8 or 10-ft intervals. Every possible precaution has been taken to eliminate error and the results appear to be very consistent."

TAKING PROTOTYPE WATER-SURFACE PROFILES

The form and principal dimensions of one of the basins are shown in Fig. 1. The water-surface profiles were secured by reading staff gages painted on both outside walls of the stilling basin. These gages were sufficiently close together to permit a fairly accurate tracing of the profile. The data taken included headwater and tailwater elevations. Discharges were read from a discharge curve obtained from the flow measurements. The results of these measurements form the basis for a graph, drawn for each staff gage, showing the relation between discharge and average water-surface elevations, for both model and prototype.

The hydraulic models were built at the Hydraulics Laboratory of the State University of Iowa. The scale ratio used was 1:36, giving an overall length of model of about 18 ft, including conduits. The discharge required for the Englewood model was 1.54 cu ft per sec, and that for the Germantown model was 1.29 cu ft per sec, corresponding to design discharges for the prototype of 12,000 and 10,000 cu ft per sec respectively.

A 1:2$^{1}/_{2}$ mixture of cement and sand was used for the models, which was poured in carefully constructed wooden forms. Measurements made on the completed models, to determine the effect of any sagging in the forms and contraction in the concrete, indicated that the greatest errors occurred in the vertical dimensions, where an average error in the order of 2% existed (corresponding to about $^{1}/_{32}$ in.). Longitudinal and transverse errors were negligible.



MODEL OF ENGLEWOOD STILLING BASIN SET UP IN LABORATORY AT UNIVERSITY OF IOWA

Particular attention was given to the warped outlet section, as inaccuracy at this point might have had a large effect on the hydraulic action of the basins. In order to establish a velocity distribution similar to that in the prototype conduits, it was thought necessary to reproduce only a length equal to forty diameters of conduit.

The outlet structure at Englewood Dam is quite similar to that at Germantown Dam. The Englewood outlet employs a deeper pool and a somewhat simpler design. The two conduits are identical, with the exception that the Englewood tunnels have somewhat higher walls than the Germantown structure. This greater height was obtained in the model by increasing the height of the vertical walls, using the same tunnel width and arch section as in the Germantown model.

Since the object of the model tests was to determine the water-surface profiles through the basin for known discharges, it was necessary to match the corresponding discharge and tailwater conditions observed in the prototype. For this, a tailwater control apparatus was used.

Discharges were measured by weighing and timing. After calibration, the conduits were used as flow meters, a piezometer connection in the head tanks serving to register the head. From the readings on this piezometer at the various measured discharges, a discharge-head curve was prepared for each model. Using these curves and the observed tailwater elevations for various discharges, a curve was constructed for each model showing the relation between headwater and tailwater elevations. Tailwater elevations in the model were determined by means of a hook gage in a stilling well.

Small staff gages, constructed so that the corresponding prototype water levels could be read directly, were fastened on both outer walls of the model in locations corresponding to those on the prototype.

COMPARISON OF DATA

Although there were minor differences, the agreement between the model and prototype results seems as close as could be expected in view of the difficulty of accurately determining the mean levels of such rapidly fluctuating water surfaces. The major water currents in the models of the stilling basins closely duplicated those in the prototype, as nearly as could be determined from the available prototype photographs. There appeared to be a difference in the texture of the water surface in the model and prototype, the turbulence eddies being relatively much larger in the model. This was probably due to the fact that the same fluid was used in both, thus tending to produce eddies of the same size in both, or relatively larger ones in the model. In the

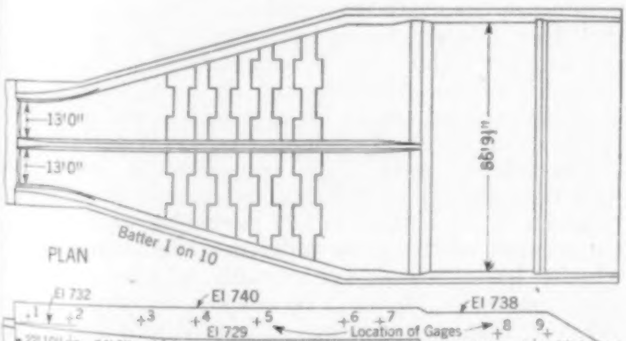


Fig. 1. Plan and Section of Stilling Basin, Germantown Dam

Hydraulic Jump in Stilling Pool at Germantown Dam Outlet

model this produced water surfaces that were relatively rougher than those in the prototype. In order to produce relatively similar turbulence, it would have been necessary to reduce the viscosity of the model fluid.

On the basis of visual observations made by the authors on these and many other models, and also of actual cases and photographs of very large hydraulic jumps, it is believed that the jump in the prototype usually takes place in a relatively shorter length than in the model, with the result that the slope of the water face in the prototype is much steeper than that in the model. The data obtained on these tests give, so far as is known, the first quantitative information to check this belief.

At Gages 5 and 6 (Fig. 1) on both models there was a distinct tendency for the prototype observations to fall above those observed in the models. This would happen if the prototype jump were steeper than the model jump. This difference is probably caused by the tendency toward relatively smaller eddies in the prototype, as previously explained, which causes a more thorough mixing of the water in the prototype, consequently causing the momentum change, and therefore the change in water surface elevation, to occur in a relatively shorter length, giving a steeper surface slope. Fortunately this tendency leads to greater safety in designs based on model studies, since less scour would be produced in the prototype than the model would indicate.

Another difference between model and prototype action is the splashing of individual drops of water in the former, probably due to the breaking of bubbles. In the model, drops of water would occasionally splash a foot or more in the air. This would correspond in the prototype to masses of water as big as baseballs flying 36 ft or more in the air, which action, of course, did not occur. In general, the models duplicated the action of the prototypes. There were minor differences as has been explained. These however were not of sufficient magnitude to have any practical effect on design. The results of these tests are further evidence of the reliability of hydraulic model tests as an aid in the design of hydraulic structures.

The writers wish to express their appreciation to the Miami Conservancy District, and more especially to C. H. Eiffert and C. S. Bennett, respectively Chief Engineer and Engineer of the District, whose generosity in furnishing plans and data made this study possible. Helpful suggestions were given by Professors J. W. Howe and A. A. Kalinske, of the State University of Iowa. All are members of the Society.

BRONX-WHITESTONE BRIDGE, NEW YORK
Near Entrance to Long Island Sound

Design of Bridges Against Wind

III. Elementary Explanation of Aerodynamic Instability

By D. B. STEINMAN, M. ASCE
CONSULTING ENGINEER, NEW YORK, N.Y.

PREVIOUS articles in this series have described the nature of the problem of wind effects on bridges, and have given notable examples both of the present day and of a century or more ago. This article deals with the principles involved, affecting torsional as well as vertical stability of the bridge section. What could be a very mathematical treatment is reduced instead to simple descriptive terms, naturally leading up to the theme of the succeeding article—what to do about the problem.

A CONSISTENT theory should stand the test of non-mathematical statement. Truths as well as errors may be obscured or unperceived when stated in purely mathematical terms. The translation of the underlying concepts and the developed relations of aerodynamic instability into simple language is not easy. The following attempt is submitted in the hope that it may prove helpful in clarifying thought and in facilitating critical scrutiny.

Certain elementary sections—such as a half-round bar with its flat face toward the wind, a T-section with its head toward the wind, or even a flat vertical plate facing the wind—when mounted between springs or on a pendulum and exposed to the direct wind from an electric fan, will build up rapidly amplifying oscillations which, oddly enough, are transverse to the wind. When pivoted in the middle and mounted as a pinwheel facing the wind, these sections will acquire a rapidly accelerated spin, but in a direction opposite to the spin of the fan! Such sections are aerodynamically unstable sections.

On the other hand, certain other sections—such as a half-round with its convex side toward the wind, a T-section with its stem toward the wind, or a narrow horizontal strip with an edge toward the wind—when similarly mounted and exposed, may show a tremor or flutter but will not build up amplifying oscillations; and when mounted as a pinwheel, these sections will spin slowly at a uniform speed in the same direction as the fan. Such sections are aerodynamically stable sections.

Other tests will yield the same differentiation. In a static wind-tunnel test, that is, a wind test on a stationary model, a wind inclined upward will yield upward lift on aerodynamically stable sections, and (paradoxical as it may seem) a downward lift on aerodynamically unstable sections. Also, the static lift graph, showing the variation of vertical lift with angle of attack, will have a positive slope in the case of the stable sections and a negative slope in the case of the unstable sections.

When we pass from these elementary sections to wider sections, such as H-sections having the proportionate ratios of actual bridge cross-sections, their potential torsional instability needs to be considered as well as their vertical instability. The foregoing classification is simply extended, as indicated in Fig. 1. A wind inclined upward, represented by R, may produce a resultant lift represented by L_1, L_2, or L_3, corresponding to three different categories of stability as follows: L_1 (the ideal case) vertically and torsionally stable; L_2 (the most common case) vertically stable but torsionally unstable; and L_3 (the least common case) vertically and torsionally unstable. The proportions of the section (using the ratio of depth d to width b in the case of plate-girder bridges, and the reduced ratio of the equivalent H-section in the case of truss bridges) determine the category of stability, L_1 for $d/b < 0.06$, L_2 for $d/b = 0.06$ to 0.24, and L_3 for $d/b > 0.24$.

The static wind-tunnel graphs will yield the same classification: L_1, positive slope of lift graph and of torque graph; L_2, positive slope of lift graph but negative slope of torque graph; and L_3, negative slope of both lift graph and torque graph. These classifications determine the basic stability or instability of the section (with respect to vertical and torsional oscillations, respectively).

Because these bridge sections have a material width, another factor comes into play when they are actually oscillating, namely the effect of phase difference across the width of the section. An aerodynamic disturbance, initiated at the windward girder, takes time to traverse the section and encounters a progressive difference of phase as it traverses the oscillating section. As different points of the width are reached, different stages of the cycle of oscillation are encountered, including differences of velocity and even differences of direction of motion. The overall phase-difference effect is determined by the velocity V of the wind relative to the width b of the section and the frequency N of the harmonic oscillation. The ratio Nb/V is the fraction or multiple of a cycle required for the disturbance to traverse the width of the section, and the reciprocal ratio V/Nb is the fraction or multiple of the width traversed per cycle. For studying the effect of different wind velocities V, they are reduced (for simplicity and scientific consistency) to the velocity ratios V/Nb, non-dimensional. By using these instead of V, the critical ranges for any section are made constant, independent of mode or frequency of oscillation.

The velocity ratio V/Nb, considered in conjunction with the category of stability, determines the potential behavior of the section at any particular wind velocity. On account of the phase-difference effect, any section, whether basically stable or unstable, may have potential aerodynamic instability in certain critical ranges of wind velocity, that is, in a series of critical ranges of V/Nb. There is one vitally important difference, however:

> A basically unstable section will have an upper critical range that is unlimited, and therefore potentially catastrophic.

That critical range will extend from V_p/Nb (a critical velocity ratio due to phase difference) to infinity. A basically stable section, on the other hand, will be aerodynamically stable in the same range, from V_p/Nb to infinity. In other words, a basically stable section will have no catastrophic range—all of its critical ranges will be below the critical velocity ratio V_p/Nb. Thus the Tacoma Bridge section (belonging to type L_2) had a series of critical ranges for vertical instability but no catastrophic range for vertical instability; at the same time it had a series of critical ranges for torsional instability and also a catastrophic range for torsional instability. This fact, combined with the extreme flexibility of the span, caused the disaster. The Deer Isle Bridge section (belonging to type L_3), on the other hand, had catastrophic ranges for both vertical and torsional instability and required stiffening by diagonal stays.

STATIONARY FLOOR SYSTEM UNDER WIND

All these relations, derived mathematically by the writer, have now received multiple confirmation both by observation and by experiment—including oscillating model tests on a variety of sections by others and by the writer. In the paragraphs that follow, a simplified nonmathematical derivation is presented.

Wind inclined upward, acting on an H-section (Fig. 1), leaves a region of suction or negative pressure for some distance behind the windward girder, and exerts an upward pressure on the horizontal floor beyond the shielded range. In shallow sections (and in flat plates), this upward pressure dominates; such sections are vertically "stable" sections. In deep sections, the shielded width is longer, and consequently the negative pressure, producing a downward force, dominates; such sections are vertically "unstable." Moreover, in most sections, the upward and downward forces are on opposite sides of the midpoint, so that both produce a torque in the same direction—downward at the leading girder; such sections are torsionally "unstable." In the extreme case of flat plates and very shallow sections, the negative pressure is zero or negligible and the dominant upward pressure is stronger on the windward half of the section, producing a net torque directed upward at the leading girder; such sections are torsionally "stable."

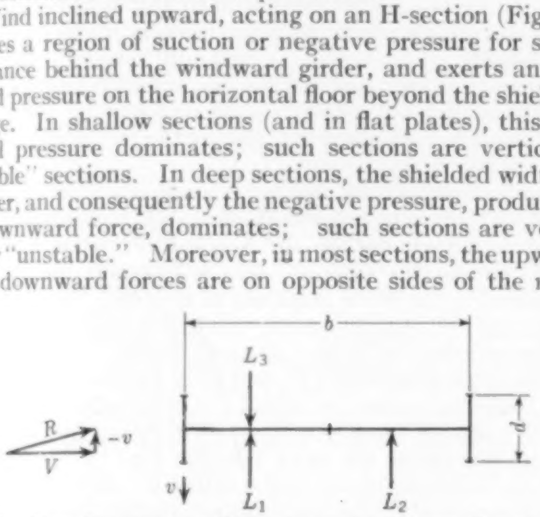


FIG. 1. LIFT RESULTANTS CHARACTERIZING THREE CATEGORIES OF AERODYNAMIC INSTABILITY OF BRIDGE SECTIONS

The foregoing picture applies to stationary sections, and the indicated characteristics, determining the classification, also the relative intensity of effect, are given by wind-tunnel tests on models of stationary sections.

CONSIDERATIONS OF VERTICAL STABILITY

Conditions affecting the presence, or lack, of vertical stability when the section is in vertical oscillating motion, will now be discussed in various categories:

Case V-1. Consider a horizontal wind of velocity V (Fig. 1) acting on an oscillating H-section at an instant when it is moving vertically downward (velocity, v). The resultant relative direction of the wind will be inclined upward at a small angle. This relatively inclined air-stream acts upon the section, producing upward pressure beyond the negative or shielded range. If the section is vertically "stable," as previously defined, this upward pressure is dominant. At high wind velocities, the relatively deflected wind-stream will reach this region of dominant upward pressure while the section is still moving downward. Opposing the direction of motion, the pressure tends to stop the oscillation.

TACOMA NARROWS BRIDGE AFTER FAILURE

This explains the vertical stability of "stable" sections in the high-velocity range.

Case V-2. If the wind velocity is sufficiently low (below a critical value designated by V_p), the upward-deflected air-stream will not reach its effective portion of the width of the section until the section has started moving upward. The dominant upward pressure will then amplify the upward motion. This explains the vertical instability of vertically "stable" sections at low wind velocities—in the "first critical range."

Case V-3. If the wind velocity is still lower, the upward-deflected air-stream will not reach its effective portion of the width until the section has started moving downward again. This explains the vertical stability of "stable" sections below the first critical range.

Case V-4. If the wind velocity is further reduced, the upward-deflected air-stream will reach the far portion of the width when the section is moving upward the second, third, or fourth time. This explains the second, third, and other successive critical ranges of (minor) vertical instability of "stable" sections in the low-velocity range.

Case V-5. If the section is vertically "unstable," the negative or downward pressure is the dominant force, and consequently the picture is reversed. At high wind velocities, the deflected air-stream becomes effective over the pertinent width of section to produce this dominant downward force while the section is still moving downward, thus producing amplification. At successively lower wind velocities, the deflected air-stream reaches the effective width of section to produce the dominant downward force when the section is moving downward a second, third, or fourth time. These cases explain the vertical instability of "unstable" sections at high wind velocities, also at successive critical ranges of low velocity. At intermediate wind velocities, the width of section contributing the dominant downward force is reached when the section is moving upward. This explains the vertical stability of "unstable" sections at low wind velocities between the critical ranges.

Since the shielded width yielding negative pressure is nearer than the exposed width contributing upward pres-

sure, the critical velocities V_p will be materially lower for "unstable" sections. Moreover this top critical velocity V_p is an upper boundary of instability for "stable" sections, and a lower boundary of instability for "unstable" sections. For the latter, there is no upper limit of wind velocity in the principal instability range; hence, for vertically "unstable" sections, this range has no upper limit of intensity and may become catastrophic.

PICTURE OF TORSIONAL STABILITY

In torsional oscillations, stability and instability follow a similar pattern, as noted under the following cases, designated for clarity T-1 to T-4. The physical picture requires a modification. The total effective angle of attack at any instant is now made up of two parts: (1) the part due to the angular position of the section, and (2) the part due to the angular velocity of the section. Since each intermediate angular position is occupied twice in a cycle, with the direction of motion reversed, the amplifying or damping effect of this first part of the angle of attack is canceled. The net effective amplification or damping is produced by the secondary part of the angle of attack, namely that due to direction and velocity of motion. The following discussion is therefore confined to this net effect—the increment of angle of attack due to the velocity of motion.

Case T-1. Consider an H-section, of normal ("unstable") proportions, in angular oscillation about its midpoint. When the leading girder is moving downward, a horizontal wind derives an increment of relative upward inclination. At high wind velocities, this upward-deflected air-stream will reach the farther part of the section beyond the shielded width while this far half of the section is swinging upward, thus producing amplification. This explains the torsional instability of "unstable" sections in the high-velocity range. Since instability increases with wind velocity, and since this range of torsional instability has no upper limit of wind velocity, it may become castastrophic.

Case T-2. If the wind velocity is sufficiently low (below a critical value V_p), the upward-deflected air-

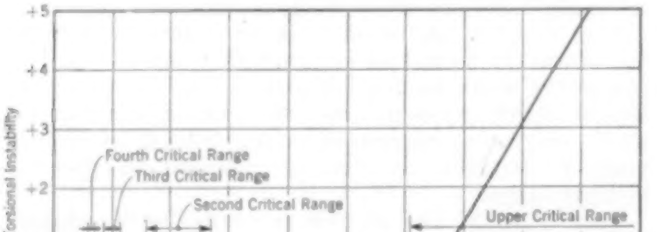


FIG. 2. CRITICAL RANGES FOR TORSIONAL INSTABILITY
A Similar Graph May Be Drawn for Vertical Instability. If the Section Is "Stable," the Graph Is Inverted

stream will not reach the far half of the section until it has started moving downward. This explains the torsional stability of torsionally "unstable" sections in the low-velocity range.

Case T-3. If the wind velocity is further progressively reduced, it will not reach the far half of the section until it has started moving upward a second, third, or fourth time. This explains the second, third, and other successive critical ranges of torsional instability of "unstable" sections at low wind velocities, with the intermediate intervals representing ranges of stability.

Case T-4. The degree of torsional instability depends upon the relative depth of the section, represented by the ratio d/b. In the deepest sections used, nearly all the width is shielded; hence the net instability torque is a minimum. With medium section ratios, a maximum of the far half of the section is exposed, producing maximum instability torque. As the relative girder depth is further reduced, more of the near half of the section becomes exposed, and the offsetting torque reduces the instability. At very shallow section ratios, including the limiting case of a flat plate, the offsetting torque developed on the near half of the section outweighs the otherwise dominant instability torque, and a torsionally "stable" section is obtained. A wind inclined upward produces an upward torque. Downward motion of the leading edge produces an upward torque. Hence the very shallow section or a flat plate is stable, both in the static torque graph and in the oscillating section.

If, however, the wind velocity is reduced below a critical value (V_p), the upward-inclined wind will not reach beyond the shielded width of the shallow section to produce a net upward torque until the near half of the section is moving upward (or relatively upward). This explains the instability of a torsionally "stable" section in the low-velocity range. Since the shielded width of the shallow section is very narrow, or zero in a flat plate, this critical velocity range, and therefore the instability, would be very low or zero.

In all cases, by the foregoing simplified reasoning, the dividing lines between ranges of stability and instability are determined, not by the absolute velocity V of the wind, but by the time it takes to traverse the section, measured in cycles or fractions of a cycle. Hence, for a given section, stability or instability is determined by a "velocity ratio" (V/Nb), as shown in Fig. 2.

Very high velocities (V) and very low frequencies (N) are thus equivalent in effect. Consequently the stationary section model (with zero frequency) in the wind tunnel represents the same limiting case as the oscillating section with infinite wind velocity. If the static lift graph recorded in the wind tunnel yields upward lift for a wind inclined upward (and the reverse), the vertically oscillating section under a high-velocity wind will be subjected to upward dominant lift whenever it is moving downward, and to downward dominant lift whenever it is moving upward.

Hence a "stable" section, as determined by wind-tunnel tests on a stationary model, is aerodynamically stable at high wind velocities. Similarly an "unstable" section is aerodynamically unstable at high wind velocities. These conclusions also apply to torsional oscillations. In other words, the stability or instability of an oscillating section at high wind velocities corresponds identically to the "stability" or "instability" shown by the static wind-tunnel graph (in lift or torque, respectively). At low wind velocities, the stability or instability of the section may be reversed, as has been outlined.

Since the aerodynamic forces and the relative velocities vary along the width of the section and through the cycle of an oscillation, the accurate calculation of the resultant effect must take these variations into account by integration over the width of the section and over the cycle. The numerical values are thereby modified, but the foregoing qualitative conclusions are confirmed.

Engineers' Notebook

Suggestions and Practical Data Useful in the Solution of a Variety of Engineering Problems

Floating Aluminum Bridges Welded by Carbon Arc Process

By W. J. Conley

Consulting Engineer, The Lincoln Electric Company, Cleveland, Ohio

Among the unusual structures that have been fabricated by the carbon arc welding process are the floating bridges used by the Army Engineers. Particularly important in this case are simplicity and reliability of joints.

End View of Bridge Balk Section Showing Welded Construction

To carry large vehicles, including heavy tanks, the floating sections had to have maximum buoyancy with minimum bulk and weight. Also, to preclude the possibility of leaks, all joints were required to withstand a hydrostatic test far exceeding any condition expected to be encountered in field service.

The new floating structure, designated as the M-4 bridge, is said to have a capacity of 50 tons, is transported in fast motor trucks, and can be assembled ready for use in less time than any other ponton-type bridge ever designed. Main assembly of the bridge units consists of aluminum hollow-deck balks. The deck balks, which replace the balk stringers and chess flooring formerly used for the conventional type of wooden deck bridge, are sufficiently buoyant to support fully loaded trucks even if all the pontons should be sunk, according to engineering authorities. Construction of the bridge was made possible by the "electronic tornado," a process of automatic carbon arc welding which is becoming more and more prevalent in the welding of aluminum and in other fields of metal fabrication.

The fabricating procedure here described is typical of the general methods of automatic carbon arc welding used by the following concerns engaged in this work: Allison Steel Manufacturing Company, Phoenix, Ariz.; American Air Filter Company, Louisville, Ky.; Clinton Bridge Works, Clinton, Iowa; Copco Steel and Engineering Company, Detroit, Mich.; Harold H. Cotton, Inc., Lowell, Mass.; J. M. Dalglish and Company, St. Paul, Minn.; International Steel Company, Evansville, Ind.

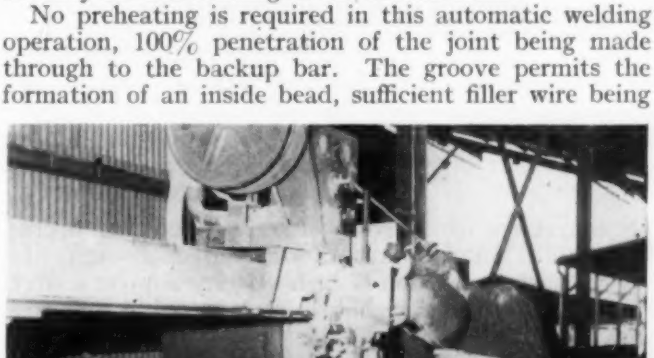
EXTRUDED CHANNELS USED

Fabrication of the hollow-deck balk is an interesting study in efficient design. The principal members consist of 10-in. extruded 14 ST aluminum channels, 15 ft in length and having $^{3}/_{16}$-in. vertical webs and $^{3}/_{8}$-in. tops and bottoms. End plates are of 61 ST aluminum, $^{3}/_{16}$ in. thick. The first step is the butting together of the sides of the two channels and their fusion into an integral box section by applying the automatic carbon arc process along the seam on both sides. The channels are mounted on a separate fixture,, which holds them firmly together without the need of tacking.

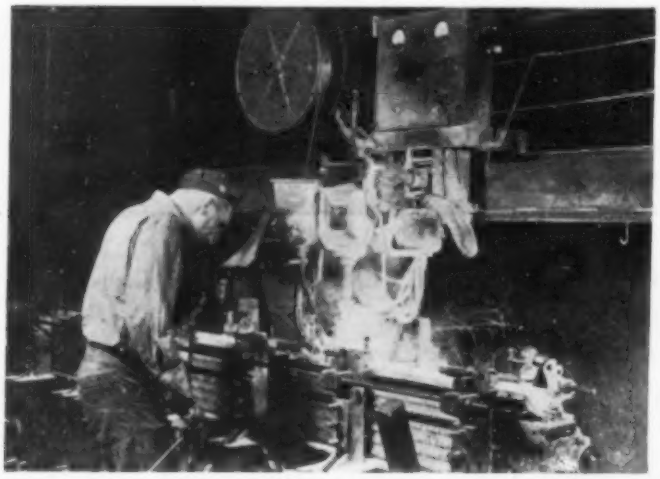
A groove backup strip is used on the under side of the seam which utilizes an ingenious pressure arrangement in the form of a mandrel and fire hose applying uniform pressure along the entire length of the backup strip. When the work is mounted, the fixture is moved along a conveyor and locked in position under the arc of the "electronic tornado" unit. The welding head moves on a travel beam, welding the parts at a rate of about 34 in. per min, while the work remains stationary. Approximately 2 lb of flux is used per pound of filler wire, and about 10 ft of weld bead is deposited per pound of flux and 20 ft of wire.

After one side is welded, the fixture is moved out and replaced with another fixture similarly set up. While the initial seam of the second workpiece is being welded, helpers remove the first partially welded assembly from its fixture, turn it over, replace it in the fixture, and have it ready for the welding of the second seam.

No preheating is required in this automatic welding operation, 100% penetration of the joint being made through to the backup bar. The groove permits the formation of an inside bead, sufficient filler wire being



General View of Automatic Carbon Arc Welding of Aluminum Deck Balk
Fire-Hose in Left Foreground Applies Pressure to Groove Backup Bar Under Seam



"ELECTRONIC TORNADO" IN OPERATION ON NORMAL BALK SECTION
Note Heavy Construction of Welding Fixture and Expandable Core
(Photo Courtesy American Air Filter Company, Louisville, Ky.)

added while welding to obtain a built-up weld on the outside that is about $^{1}/_{16}$ in. high and $^{1}/_{2}$ in. wide, with dense beads. The former difficulty of poor fit-up sometimes encountered has now been almost entirely eliminated. Now, only about 5% of the edges require trimming for uniform fit-up before welding.

DOWNHAND WELDING OF END PLATES

After the automatic carbon arc welding is completed, the balks are moved on a conveyor to the manual welding department, where the end pieces are inserted. The ends are fused on a 7° angle to seal the box section at each end. These pieces are hand welded with $^{5}/_{32}$-in. aluminum shielded arc rod specially designed for welding aluminum in any form. All hand welding is done downhand, with the work at an angle of about 45°.

After hand welding, leaks were formerly encountered occasionally at the corners of the end pieces, but a procedure was worked out whereby the corners were first tacked solidly, using considerable heat; then the finish welds were made down to the corners. All balk sections must withstand a hydrostatic test. The efficiency of the welding procedures that have been described is evidenced by the fact that currently rejects amount to only about 5%, all of which are corrected.

Average production per machine is about 30 completed deck balks per 9-hr shift, and the trend is toward increased production as the operators become more efficient. Minor variations in the welding setups were used in other shops doing this work.

The photographs accompanying this article are used through courtesy of the Lincoln Electric Company.

CLOSE-UP OF MANUAL WELDING OF END PLATE
Jig Holds Sides in Position to Prevent Buckling, and Temporary Plug Keeps Weld Splatter from Fouling Threads; Welder Easily Rotates Work as Position Requires

Air Entrainment on Spillway Faces

By G. H. HICKOX, M. ASCE
SENIOR HYDRAULIC ENGINEER, TVA, NORRIS, TENN.

IN connection with a study of aerated flow, the operation of TVA spillways afforded an opportunity to observe surface aeration of high-velocity flow on a large scale. Observation of Norris and Douglas spillways showed that in the case of water flowing down a spillway face, the distance from the crest at which air entrainment begins is a function of the depth of flow. This is illustrated by the accompanying photographs.

Observations made of spillway flow on Norris Dam (both model and prototype) and on Douglas Dam have

NORRIS DAM SPILLWAY SHOWING EFFECT OF DISCHARGE ON BEGINNING OF AIR ENTRAINMENT
At Discharges of (a) 13, (b) 70, and (c) 87 Cu Ft per Sec per Ft of Crest

been plotted in Fig. 1. Discharge per foot of crest is plotted against length along the spillway face to the point where the surface entrainment of air begins. Prototype lengths were scaled from photographs, as facilities for field measurements were not available.

The increase in this length with increased discharge, and correspondingly, with increased depth of flow, suggests the possibility that surface entrainment of air begins at the point where turbulence, generated at the water-concrete interface, finally reaches the surface. Where entrainment begins, as evidenced by the white appearance, drops of water detach themselves from the solid sheet. It is suggested that these drops are thrown from the main stream by virtue of the kinetic energy they possess in a direction normal to the surface as the result of turbulent mixing.

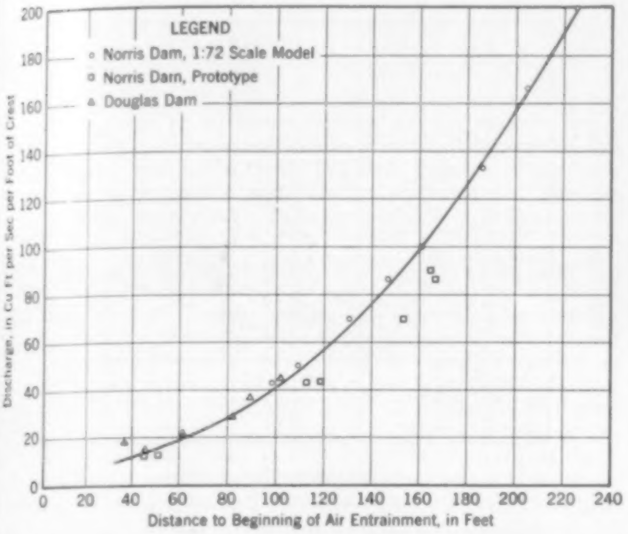


Fig. 1. Effect of Spillway Discharge on Distance to Beginning of Air Entrainment

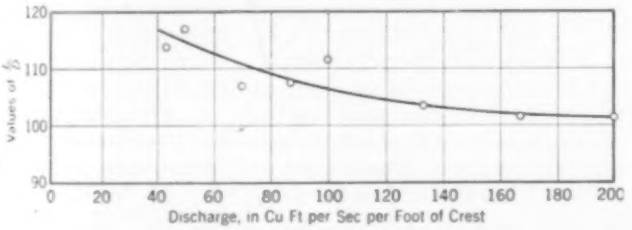
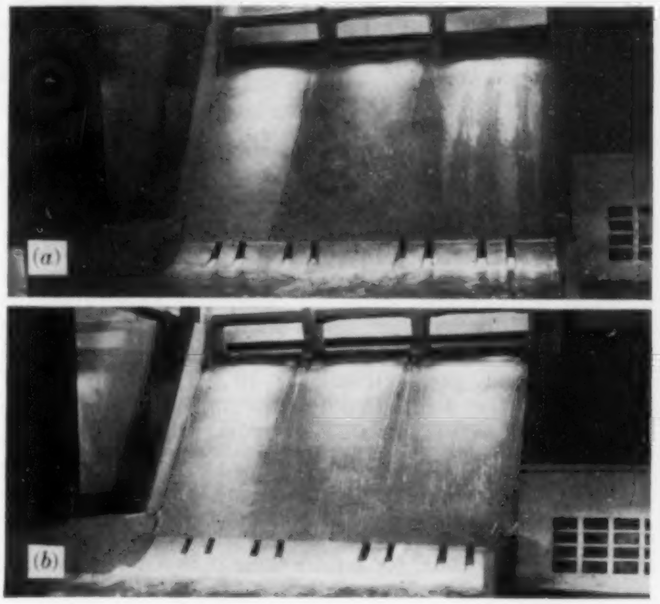


Fig. 2. Ratio Between Distance to Beginning of Air Entrainment and Water Depth

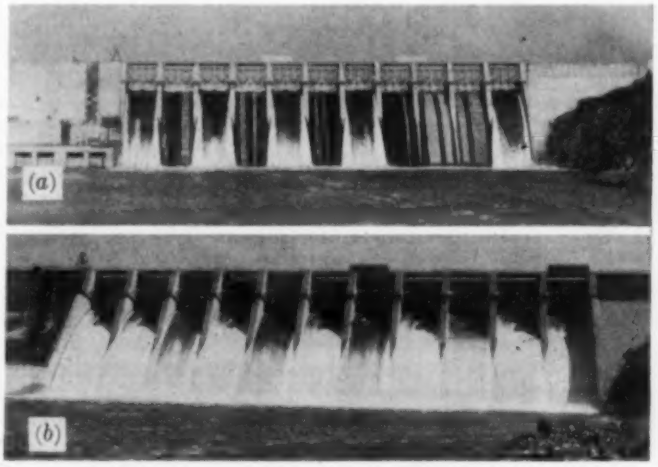
It has been argued that surface entrainment of air is largely due to friction at the surface, generated by the high relative velocity of air and water. If this is true, it is necessary to explain why the phenomenon occurs at such widely differing velocities, as indicated, for example, in the series of photographs here included on Norris Dam spillway. At high enough velocities, of course, friction becomes an important factor. However, within the range of these observations its effect was negligible.

The model of Norris Dam shown in the second group of accompanying photographs was illuminated by light rays nearly parallel to the spillway face so that irregularities in the surface might be easily seen. Operating conditions simulated discharges of 70 and 87 cu ft per sec per ft of crest. It is interesting to note that the roughness of the surface begins in the model at a location almost identical with that in the prototype. The results are shown in Fig. 1. The roughness in the model water surface is attributed to the same cause as it is in the prototype. Drops of water do not leave the surface in the model because their energy is not sufficient to overcome the restraining force of surface tension. It is clear that the disturbance of the surface in the model is not due to friction between air and water, as thicker sheets have been observed to fall much greater distances—and with higher velocities—with perfectly smooth surfaces.



Model of Norris Dam Spillway (Scale 1:72)
At Discharges Simulating (*a*) 70, and (*b*) 87 Cu Ft per Sec per Ft of Crest on Prototype

To show the relationship between discharge per foot of crest, distance to beginning of air entrainment, and depth at air entrainment, Fig. 2 has been prepared. As it was impossible to measure depths on the prototype structures, the data are taken only from the 1:72 scale model of Norris Dam. Discharges are in terms of prototype dimensions. It is interesting to note that the ratio L/D, length along spillway face to depth of water, is nearly constant for all discharges, indicating that the rate of expansion of turbulence is of the order of about 1 to 100.



Douglas Dam Discharging Beneath Tainter Gates
Discharges Are (*a*) 45; and (*b*) 15, 22, and 29 Cu Ft per Sec Ft of Crest, Respectively, Under Fourth, Third, and Fifth Gates from Right End

Prestretched Reinforcing Bars Show High Strength in University of Iowa Tests

By B. J. LAMBERT *and* NED L. ASHTON, MEMBERS ASCE

RESPECTIVELY, PROFESSOR AND ASSISTANT PROFESSOR OF CIVIL ENGINEERING, STATE UNIVERSITY OF IOWA, IOWA CITY, IOWA

FEATURES new and interesting in the reinforcing of concrete structures have been discovered in a series of tests carried on in the Materials Laboratory at the State University of Iowa. The tests have shown rather conclusively that, by using any type of commercial reinforcing bar, prestretched say 10% either at mill or warehouse, the strength of a beam or slab can be increased up to 50% or more, beyond that of the same beam or slab in which the ordinary unstretched bar is used.

The purpose of these tests was to determine the effect of prestretching ordinary commercial reinforcing, using the prestretched bars for reinforcement in a set of beams, and then comparing the results with those obtained from beams of the same size in which similar unstretched bars were used.

For the 18 beams used in the tests noted here, 18 exactly similar sets of three reinforcing bars were fabricated, of which 9 sets of 3 bars each were made of commercial rods stretched 10% beyond their ordinary length, and 9 sets were made of unstretched commercial rods as bought. The tabular record (Table I) of the tests tells

TABLE I. TABULAR RECORD OF BEAM TESTS

All Beams 6 In. Wide and 72 In. Long, with Three Bars of 3/8-In. Diameter

Effective Depth of Beam, In.	Rods* Used	f_c', in Lb per Sq In.	f_s' in Lb per Sq In.	$\Delta_{y.p.}$ in In.	Load at Yield Point in Lb	Ultimate Load in Lb
3	P-S	4,070	51,900	11/16	3,005	...
3	P	3,720	41,700	5/16	....	1,880
2 15/16	C-S	3,530	77,200	15/16	3,850	...
2 15/16	C	3,220	56,000	11/16	....	2,650
3 5/16	S-S	4,470	70,000	...	4,540	...
3 7/16	S	4,080	50,000	...	....	2,935
5 1/8	P-S	4,500	51,900	5/16	5,730	5,930
5 3/16	P	3,750	41,500	3/16	4,000	4,200
5 5/8	C-S	4,320	55,500	1/2	9,000	...
5 1/4	C	4,670	56,500	1/4	5,400	6,100
5	S-S	4,030	70,000	7/16	6,010	6,200
5	S	4,380	50,000	1/4	3,990	4,200
7 5/16	P-S	3,900	51,900	5/16	8,400	...
7 7/16	P	3,890	41,700	9/16	....	5,600
7 7/16	C-S	3,640	77,200	...	12,480	...
7 3/8	C	3,640	55,500	5/16	....	7,800
7 1/8	S-S	4,000	70,000	...	....	9,720
7 1/8	S	3,400	50,000	...	....	6,920

* P = plain round bar; P-S = plain round bar stretched 10%
C = corrugated bar; C-S = corrugated bar stretched 10%
S = special corrugated bar; S-S = special corrugated bar stretched 10%

its own story. Take for instance the first two beams in the table. Both have the same dimensions. Both have the same size and number of reinforcing bars. The bars in the first beam were stretched and as a result the beam tested 60% stronger than the second beam with unstretched bars.

Comparing beams of 5-in. depth having plain and prestretched bars, the showing is 35% in favor of the prestretched bars.

Comparing the beams of 7-in. depth, the showing is 50% in favor of the prestretched bars. Other tests gave similar results.

In all cases—and the 18 shown are only a part of the picture—a comparison of the strength of the beams shows an increase of 30% to 65% for those in which pre-

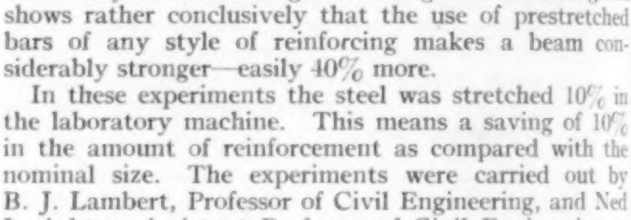
FIG. 1. COMPARISON OF BEAM STRENGTHS

In All Cases Area of Steel Is 0.66 Sq In. per Ft and $f_c' = 4{,}000$ Lb per Sq In.; Character of Reinforcement Is Indicated by Arrows and Same Terms Used in Table I

stretched bars were used, as compared with the beams in which the unstretched reinforcing was used.

The final results obtained from all the tests at the University of Iowa are given in Fig. 1. This diagram shows rather conclusively that the use of prestretched bars of any style of reinforcing makes a beam considerably stronger—easily 40% more.

In these experiments the steel was stretched 10% in the laboratory machine. This means a saving of 10% in the amount of reinforcement as compared with the nominal size. The experiments were carried out by B. J. Lambert, Professor of Civil Engineering, and Ned L. Ashton, Assistant Professor of Civil Engineering at the State University of Iowa, in the Materials Laboratory. Rather complete records of the stress-strain relations and of the elastic behavior of these beams under test were made. These data will later be available on request from the author for those who may be interested.



REINFORCED CONCRETE BEAMS USED IN IOWA TESTS
Prestretched Bars Used in First, Third, and Fifth

OUR READERS SAY—

In Comment on Papers, Society Affairs, and Related Professional Interest

Phenomenon of "Flashes" at Outlet of Sluices

Dear Sir: In his paper, "Performance of TVA Structures Studied," in the October issue, Mr. Hickox refers to curious "flashes" resembling lightning, which occur near the outlet of sluices discharging at very high velocity into the tailwater below several TVA dams. A similar occurrence has been observed under identical conditions at Norfork Dam, a multiple-purpose project constructed by the Little Rock Engineer District of the War Department, near Norfork, Ark. It is understood that the phenomenon has also been observed at a number of Western dams under similar circumstances.

On several occasions when water was being discharged from the Norfork outlet conduits at velocities over 90 ft per sec, the writer witnessed the spectacle described by Mr. Hickox. The so-called flashes appeared to originate at the boundaries of the high-velocity jet and, in some instances, were partly obscured by the white-water and spray on the surface of the water. The visible evidence of each flash was not a momentary glow but rather the very high velocity movement of a band of light in a direction normal to the length of the band. The intensity of the flashes appeared to vary on different occasions, but without regard to temperature or humidity. There has been no evidence of an electrical charge on metal gate accessories that project into the operating gallery in the dam. Mr. Hickox notes that the flashes are brilliant enough to be seen in sunlight. As a matter of fact, at least in the case of the Norfork Dam occurrences, they can be seen only in daylight. Thus, observers at Norfork Dam have watched the flashes diminish in intensity and disappear at nightfall. There is no record of the flashes being observed in complete darkness.

It is the writer's belief that the phenomenon noted by Mr. Hickox is not an electrical discharge, as has been suggested, but a band of refracted light moving with the velocity of an elastic wave in the compressible air-water mixture which surrounds the high-velocity jet. It has been noted that the flashes appear to be synchronous with deep thunder-like noises and powerful vibrations which can be felt on adjoining portions of the massive dam structure. It is suggested that the shock which generates the compression waves is produced by the violent vibratory transverse motion of the jet—an action resembling the contortions of the free end of a flexible hose discharging under very high pressure. In *Fluid Mechanics for Hydraulic Engineers* (page 368) Rouse points out that momentary variations in density produced by elastic wave fronts in gaseous media produce changes in the refractive power of the fluid which enable the wave front to be recorded photographically as a line of transmitted light. As the celerity of propagation of an elastic wave in an air-water mixture could be expected to fall somewhere between 1,100 and 4,700 ft per sec (i.e., the approximate velocity of sound waves in air and water, respectively), the visible flash might easily be mistakenly considered by the human eye to resemble an electrical discharge. For similar reasons, the occurrence would be impossible to record photographically with ordinary mechanical camera shutters.

It will be of interest to know whether the writer's explanation of the phenomenon described by Mr. Hickox is consistent with the observations of others.

Little Rock, Ark. Carl E. Kindsvater, Jun. ASCE

Service Records Should Be Kept

To the Editor: In the February 1935 issue of Civil Engineering, I reported briefly on the condition of a 500-ton concrete barge, which I designed and built at Seattle in 1918. This was the first job on which vibration was used in the placement of concrete. I recently had an opportunity to make an examination of the barge, in the company of Homer M. Hadley, of the Portland Cement Association, and Floyd P. Schultz, of the U.S. Army Engineers.

At that time no concrete vessels had been built in this country. Thus it was necessary to start from scratch, both in design and in construction technique. Many points now accepted were then in grave question. Division into a number of watertight compartments was an obvious measure. Two longitudinal and four cross bulkheads provided 12 such compartments. Use as a tanker was considered, so all bulkheads and walls were reinforced against stresses from both directions. Double layers of reinforcement in 3-in. walls allowed a steel coverage of only $^3/_4$ in. Such thin sections were necessary to secure a reasonable pay-load ratio—in this case, 63%.

The barge is now used as a fuel-oil tanker, a system of pipes having been installed to interconnect the compartments. Along the sides of the middle half, a series of vertical hair cracks exist, probably the result of hogging and sagging stresses. However, not a trace of rust or stain shows along these cracks, so there has apparently been no rusting of reinforcement from contact with sea water. After 26 years of constant service, there has been no leakage whatsoever. Wendell Foss, president of the Foss Barge Company, states that it is the most economical barge his company owns for the type of service in question, because for 26 years it has shown practically no depreciation and little maintenance expense, in spite of rough service. At three points, recent collisions have flaked off concrete to a depth of $^1/_4$ to $^1/_2$ in., and the texture is as bright and clean as the day it was poured.

Concrete is a desirable material for many uses, but is limited by its capacity to maintain its strength and integrity in the environment where it is placed in service. There are many kinds of concrete. Under severe conditions a poorly executed job may fail, whereas one that is properly designed and executed may be entirely successful. These are truisms, but it is my belief that the only way an adequate body of knowledge of the subject can be built up is by following individual cases through their service lives. Unfortunately these lives are often so long that the persons familiar with their inception are not alive to write the final chapters. It is here that the deathless corporation, governmental agency or technical society, must step in. When the end of service comes, with an adequate record of original materials and methods and of service conditions, it is possible to assess the adequacy and economy of the service in any particular case.

This letter has been written to leave a record of essential data and to report on the condition of the structure in question in the 26th year of service. I will not be here to write the later chapters, but it is my hope that some one will pick up the tale about 1960–1970, and that others will carry on to the end.

W. C. Muldrow, Assoc. M. ASCE
Engineer, U.S. Army Engineers,
Portland, Ore. *Portland District*

Evaluation of Sewage Works Data

To the Editor: The three principal reasons for obtaining, recording, and preserving sewage works data are set forth admirably by Messrs. Havens and Jones, in the September issue. However, the kind of data outlined applies to the more or less ideal situation; whereas some emphasis might be placed upon the difference in the kind of reliable data obtainable at the small plants, with part-time operation and sampling, as compared to the larger plants functioning on a full-time basis.

I have long questioned the real value of per capita information since population figures are often obsolete or inaccurate, and again the entire area of a given community may not be served by the treatment plant in question. In the case of Akron, Ohio, for instance, one must depend upon an estimate of the unserved or unsewered area or areas. This, coupled with the uncertainty of the total population figure, makes two unknowns. If meters are properly checked and found to be recording within the limits of error of the instrument, it would seem that the sewage volume would provide a better basis for unit calculations.

Exception should be taken to the necessity for bacterial analyses. When a plant effluent discharges into a body of water that is used

later as a water supply or for recreational purposes or if it enters an oyster or clam-growing area, then bacterial determinations are of prime importance and can be limited to the total count and presumptive tests for gas formers.

If we are to compare such data as 5-day B.O.D. and grease values, then the standard incubation temperature should be maintained at all plants, or records of the divergencies from 20 C should be kept. For grease results some specific standard should be established as to the solvent to be used.

Analysts should record all analytical data, as obtained, regardless of discrepancies. If the absurdity of certain data cannot be explained, then duplicates can be run promptly. If unexplainable discrepancies persist, then good judgment must be used in determining whether or not to include the results in the weekly, monthly, or yearly averages. Concerning the routine data that should be kept, reference to chemical precipitation plants as well as to vacuum filtration and incineration of sludge seems to have been slighted. These are at least partially controllable units, for which such essential data as quantity and kinds of chemicals used, hours of burn, life of filter cloths, and quantity of auxiliary fuel used should be recorded. I do not believe that too many data can be kept. For instance, precipitation records should be kept at various points in town as well as at the plant, for frequently there will be rain in town and not at the plant or vice versa.

The authors say, "Much has been written concerning sampling, yet the fact remains that the most important factor is the sampler." This point cannot be stressed too strongly, yet the superintendent or chief operator is in a quandry to know how to obtain honest and conscientious samplers at the rates of pay normally provided by municipalities. Even the use of a watchman's clock proves useless if the sampler wishes to circumvent proper sampling procedure. Perhaps the real answer is some form of licensing of all sewage plant employees doing any important job, thus stimulating their interest in the "whys" of their work.

It is gratifying to note that the authors consider the sludge-producing solids as the major problem in practically every sewage plant. If an operator has any real fault to find with a designer, it is because the sludge-handling facilities frequently are inadequate; yet in justice to the designer this is often due to insufficient funds. Public officials must be educated to the needs of the situation, so that adequate funds will be provided if some of our future plants are not to be found too small even before they are in operation.

In reference to the attempt on the part of one of the authors to establish the drying capacity of sludge beds, it is well to note that it is of little concern to the average operator whether or not the sludge removed has a specific moisture content so long as it can be handled readily without removing too much sand. Consequently beds are not always cleared when ready, but rather when the labor force is not needed on some other important job. A log should be kept giving the date of filling, when the bed is ready to be cleaned, and when this actually is accomplished.

Akron, Ohio

T. C. SCHAETZLE
Superintendent, Sewage Treatment
City of Akron

Wind-Tunnel Tests Useful

DEAR SIR: In CIVIL ENGINEERING for October Dr. Steinman, in the first of a series of articles on the design of bridges against wind forces, makes a strong case for combining modern advances in aerodynamics and vibration analysis with the time-worn and inefficient methods of design which are at present a standard part of many engineering specifications.

Two thoughts immediately come to mind. First, Dr. Steinman suggests that a research program of wind tunnel tests to determine the C_L and C_D of standard structural shapes is urgently needed to ensure that bridges be properly designed for wind forces. Such tests have been made in Germany (see, for example, Prandtl-Betz, *Ergebnisse der Aerodynamischen Versuchsanstalt zu Gottingen*, 3 Lief., 1927, pp. 146–156). However, these are of doubtful value for use in the design of an actual bridge structure, since interference effects (at gusseted joints, due to the proximity of adjacent members, between the two trusses of the bridge, at the piers, etc.) would require a mass of tabular forms plus so many correction factors for special conditions as to make the cost and complexity of the resulting analysis excessive—even assuming the designer could then feel reasonably certain as to the correctness of the order of magnitude of the result.

On the other hand, a wind-tunnel test of a scale model of the complete structure would show how the structure would actually react to a variety of possible wind loadings. The critical design conditions and required corrective measures could then be determined with certainty. As to the cost of this test, it would be a small item when compared to the cost of the structure—especially when weighed against the certain knowledge of critical design conditions obtained therefrom.

The second thought that comes to mind (as the result of Dr. Steinman's statement that civil engineers must broaden their outlook to include a knowledge of aerodynamics and vibration analysis) relates to a fundamental philosophy of many civil engineers and to many college curricula in civil engineering. For many years civil engineers have been rebuked for their general lack of interest in any analysis that requires a knowledge of mathematics greater than elementary calculus. This lack of interest, however, must be overcome if, in the future, we are rightly to call ourselves engineers and if we are to properly solve and economically design the more advanced structures that most certainly will be developed as our knowledge of structural action increases.

At this moment it looks very much as if the aeronautical and mechanical engineers have taken the play away from civil engineers in matters of structural analysis and mechanics (including fluid mechanics). Let's not call a problem a "civil engineering problem" or a "mechanical engineering problem" or a "problem in applied mathematics." But should not a well-trained civil engineer be able to handle, as Dr. Steinman suggests, the design of a bridge under wind loads and vibration? Or, putting the question in a different form, "Should a civil engineer be capable of solving a problem in fluid mechanics? In structures?" He should and if the fluid mechanics problem should happen to deal with the fluid which we call air, and the structural problem with the structure called a plate, is the civil engineer justified in throwing up his hands and saying "Not my field—too complicated"?

Is it not desirable to broaden our college curricula in civil engineering to provide our future civil engineers with a firm and thorough background in the subjects that make a man a civil engineer? And surely structures and mechanics are two of those subjects.

SIDNEY F. BORG, Assoc. M. ASCE
Assistant Professor of Aeronautical Engineering, Postgraduate School, U.S. Naval Academy

Annapolis, Md.

Forum on Professional Relations

In this issue Dr. Mead brings to a conclusion the department on professional relations he has been conducting in these columns for the past three years. As stated in the November number, from time to time Dr. Mead will offer a discussion of some of his own experiences in the field. Herewith he gives his answer to Question No. 37, which was announced in the October issue. The question reads as follows: "A few years ago a student was working on an engineering crew, which had charge of a grade-separation project. Occasionally the contractor would send a box of cigars and a carton of cigarettes over to the office. These were accepted. Did the crew violate any ethical consideration?

The writer remembers a visit to the office of the city engineer of an Illinois city. He was smoking a cigar and, without any ulterior purposes, offered one to the city engineer, an elderly Englishman. The engineer rejected it with the statement, "Excuse me, but I never accept anything from a contractor." The writer replied that the cigar was in no way intended as a bribe.

The writer has never hesitated to accept a cigar from a contractor working under him, but he has made it a point to return more cigars than he received. His purpose has always been not to put himself under obligation to the contractor or to any one else, and he believes that this is a proper attitude for an engineer to take. It is rather difficult to reject a small present, such as a box of cigars, which is sent to an engineer's office, and its acceptance should depend largely upon the relationship existing between the contractor and the engineer. In any event, however, the engineer should see that he is not put under any obligation, but should strive to return a gift in kind.

Madison, Wis.

DANIEL W. MEAD, Past-President and Hon. M. ASCE

SOCIETY AFFAIRS

Official and Semi-Official

Annual Meeting Scheduled for January 16-18

New York City to Be Host to 1946 Conference

With release of transportation facilities and convention restrictions, a complete Annual Meeting is planned for January 1946 to be held in New York City. When this Ninety-Third Annual Meeting convenes, all sessions will be held at the Hotel Commodore, on the corner of 42nd Street and Lexington Avenue, New York, N.Y. Technical meetings will begin on Wednesday, January 16, and continue through Friday, January 18.

In addition to technical sessions, a number of social events have been planned. These will occupy noon and evening hours. A full announcement of arrangements will be printed in the January 1946 issue of Civil Engineering.

A general business session will open the Annual Meeting on Wednesday morning. To this assembly will be presented reports on activities of the Society during 1945, and on other items of business. Honorary Membership and Society prizes will be awarded at this opening meeting. Prizes to be awarded include:

Norman Medal
J. James R. Croes Medal
Thomas Fitch Rowland Prize
James Laurie Prize
Collingwood Prize for Juniors
Construction Engineering Prize
J. C. Stevens Award
Karl Emil Hilgard Hydraulic Prize
Rudolph Hering Medal
Alfred Noble Prize

Honorary Membership is to be conferred upon three distinguished members of the Society. Boris A. Bakhmeteff of New York City, chairman of the Society's Hydraulics Division; Charles F. Kettering of Detroit, Vice-President of General Motors Corporation; and Charles H. Purcell, Director of the California State Department of Public Works, are to be so honored.

Announcement of the induction of new officers for 1946 will be made at the opening session following a report on the results of the canvass of ballots. At the close of the session, a general members' luncheon will be held in the hotel.

Meetings of Divisions Scheduled

Technical meetings will begin on Wednesday afternoon and run through Friday. All these meetings will be held in the Commodore Hotel. The following schedule of Division sessions is tentative, subject to revision, but indicates an extensive technical program:

Wednesday afternoon, January 16
Construction, Surveying and Mapping, and Sanitary Engineering Divisions

Thursday morning, January 17
Construction, Hydraulics, Sanitary Engineering, and Soil Mechanics Divisions

Thursday afternoon
Hydraulics, Sanitary Engineering, and Soil Mechanics Divisions

Friday morning, January 18
City Planning–Highway, Engineering Economics, and Structural Divisions

Friday afternoon
City Planning–Highway, Power, and Structural Divisions

Plans for these programs are being prepared under the guidance of Division executive committees. All details will be printed in the program, to appear in the January issue.

Entertainment Features

On Wednesday night, January 16, a dinner and dance will be held in the Grand Ballroom of the Hotel Commodore. A formal reception for the new officers and Honorary Members will also be a part of this social function. On Thursday evening the dinner-smoker will likewise be held in the Commodore. Opportunity for fellowship and the making of new friends will be afforded at this function. In connection with this dinner-smoker, arrangements can be made with the hotel for small parties to meet together, such as alumni groups. Thus reunions can be scheduled for Thursday evening if desired, without interfering with attendance at the smoker.

Special entertainment for the ladies is being arranged. A full announcement of the functions arranged for them will appear in the forthcoming program.

Field Excursion

A bus excursion is being planned for Saturday morning which will include many points of interest in the New York metropolitan area. Three special objectives of the trip are the New York Navy Yard in Brooklyn, and the Idlewild and La Guardia airports. It is planned to have buses leave the Hotel Commodore and make their first stop at the Brooklyn Navy Yard alongside the carrier *Franklin*.

After leaving the Navy Yard, these buses will go to the Idlewild Airport, which is expected to be in operation by the time of the meeting. Thence the group will be taken to La Guardia Airport, where luncheon is to be served. In so far as practicable, the route of the excursion will be over several of the parkways and express highways, thus combining points of engineering interest with general sightseeing.

New Procedure with Respect to Advance Registration

In the past, condensed programs and advance registration cards have been mailed to the entire membership. This major item of expense has not been justified. Furthermore, it is impracticable to have the summary program in the hands of members appreciably in advance of the detailed program appearing in the January issue of Civil Engineering. This year summary programs and advance registration cards will be mailed to members resident in the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, and Virginia, and to all other members making request for them. They will be sent to the latter immediately upon receipt of such request. This procedure should not deter anyone planning to attend the meeting. It is an effort toward reasonable economy and conservation of time and materials.

Another innovation is with respect to advance mailing of function tickets. All requests for function tickets should be accompanied by remittance. Remittances will be acknowledged but tickets will not be mailed. Instead, tickets ordered in advance will be held at the Society's Registration Desk at the Hotel Commodore, beginning Wednesday morning, January 16. In order that there may be no confusion in this respect, advance ticket orders should not be mailed from any point in the United States after January 10. Tickets to all functions will be on sale at the Registration Desk but the advance ordering of tickets is strongly urged in order that we may have, as soon as possible, information on expected attendance.

Advance Hotel Reservations Important

Because of the general situation existing in hotels, and particularly with respect to functions where food is served, this is an important matter. It is expected that this procedure will be advantageous to the member in that confusion is eliminated in connection with the possibility of tickets' being misplaced or left at home, lost or delayed in the mails, and also as regards the delay involved in purchasing tickets at the Registration Desk.

Although the hotel situation in New York is far from normal, those planning to attend the meeting may count on having hotel

reservations if requests are made sufficiently far in advance. For the benefit of those who have a favorite hotel in New York there is given herewith a list of hotel rates prevailing at thirteen hotels.

The Hotel Commodore has agreed to hold a certain number of rooms available to fill requests for reservations received on or before January 5. Where possible, members attending the meeting with friends should share double rooms since the shortage of single rooms is more acute. Confirmation of requests will be sent directly from the hotel at which the reservation is made. When writing to the Commodore requesting a reservation, reference should be made to the fact that the writer is planning to attend the Annual Convention of the Society.

If you are planning to attend the Annual Meeting, it is recommended that you make an **IMMEDIATE** request for a hotel reservation.

Hotel Rates

Hotels	Without Private Bath		With Private Bath	
	Single Room	Double Room	Single Room	Double Room
Commodore	....	....	$3.50 up	$6.05 up
Astor	....	....	3.00 up	5.00 up
Barclay	....	....	6.00 up	8.00 up
Biltmore	....	....	5.50 up	9.00 up
Claridge	....	....	3.50 up	5.00 up
McAlpin	$2.20 up	$3.85 up	3.30 up	4.95 up
Park Central	....	....	4.50 up	6.50 up
Pennsylvania	....	....	3.85 up	5.50 up
Pierre	....	....	7.00 up	9.00 up
Roosevelt	....	....	4.50 up	6.50 up
Taft	2.25 up	3.50 up	3.00 up	5.00 up
Vanderbilt	....	....	3.00 up	6.00 up
Woodward	....	....	3.00 up	4.00 up

Professional Records of Nominees

Brief Biographical Sketches of Candidates for Society Offices

W. W. Horner

A consulting engineer, specializing in municipal and sanitary engineering and hydraulics, W. W. Horner has long maintained an office in St. Louis, Mo. He was born in Columbia, Mo., on September 22, 1883, and educated in the public schools there and in St. Louis. In 1905 he received the degree of bachelor of science in civil engineering from Washington University (St. Louis), and in 1909 the degree of Civil Engineer. From 1905 to 1918 he held various positions in the engineering organization of the City of St. Louis, including the responsibility for the design of sewers and of paving; and from 1918 to 1933 he was Chief Engineer of Sewers and Paving for the city in charge of all such design and construction. Major projects constructed during this period were the Des Peres Drainage Project, the Oakland Express Highway, and the St. Louis Municipal Airport.

In the latter year, Mr. Horner established a consulting engineering practice in St. Louis, specializing in municipal, sanitary, and hydraulic problems. He also continued with the City of St. Louis in the capacity of consulting engineer. His other clients have included numerous cities and sanitary and drainage districts in the Middle West. He has also served as consultant to the Public Works Administration, the Soil Conservation Service, and the Interstate Committee on the Red River of the North, and as water consultant to the National Resources Committee.

W. W. Horner
Nominee for President of the Society

For several years Mr. Horner served as professor of municipal and sanitary engineering at Washington University, and from 1934 to 1937 he was special lecturer there. His educational accomplishments also include authorship of a number of articles, especially on the subject of hydraulics. In 1938 he was a joint recipient of the Society's Rudolph Hering Medal for a paper on the "Relation Between Rainfall and Runoff from Small Urban Areas," which was published in Vol. 101 of Transactions. He has, also, made notable contributions to Civil Engineering.

Elected a Junior in the Society in 1908, he became an Associate Member in 1911 and a full Member in 1917. During this long period of membership, he has served on a number of Society committees, including the Committee on Street Thoroughfares Manual, the Committee on the Planning of Underground Utilities, and the Committee on Student Chapters (chairman). He has also been a member of the Executive Committee of the Sanitary Engineering Division and chairman of the special committee that prepared a manual on "Definition of Terms Used in Sewerage and Sewage Disposal Practice." And at present he is on a Sanitary Division Committee for the revision of the terms defined in that manual. From 1933 to 1935 Mr. Horner served as Director of the Society from District 14, and he is a past-president of the St. Louis Section.

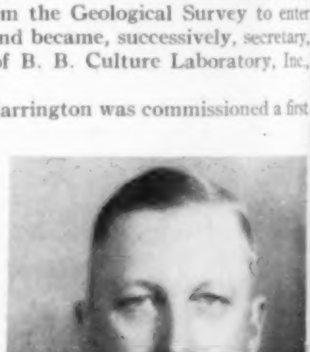
His other affiliations include membership in the American Society of Municipal Engineers (past-president), the St. Louis Engineers' Club (past-president), and the Institute of Consulting Engineers.

Arthur W. Harrington

Much of Arthur W. Harrington's career has been spent with the U. S. Geological Survey. He was born in Watertown, N.Y., on June 7, 1888, and was graduated from Cornell University in 1909 with the degree of C.E. From 1909 to 1914, he was employed by L. B. Cleveland, engineer and contractor of Watertown, N.Y., successively as engineer and assistant superintendent on general engineering projects and superintendent on station improvement work and bridge construction for the New York Central Railroad at Potsdam, N.Y.

On January 1, 1914, Mr. Harrington accepted appointment as junior engineer with the U.S. Geological Survey, with an assignment on water-resources investigations in the West. This engagement included, in addition to stream-gaging and construction work in Idaho and adjacent states, special investigations of storage in Arrowrock Reservoir, Idaho, and of water use in northern Nevada. Early in 1917, he resigned from the Geological Survey to enter commercial work in the East and became, successively, secretary, vice-president, and president of B. B. Culture Laboratory, Inc., Yonkers, N.Y.

In the summer of 1918 Mr. Harrington was commissioned a first lieutenant in the Sanitary Corps of the U.S. Army, and was in charge of sanitary facilities, water supply, and sewage disposal at various Southern camps, until his discharge from the Army in June 1920. A special feature of his Army work was his design of a drainage system for Ellington Field, Tex.



Arthur W. Harrington
Nominee for Vice-President, Zone I

In 1920, Mr. Harrington returned to the Geological Survey as hydraulic engineer at Albany, N.Y. Since 1922, when he was appointed district engineer, he has been in charge of surface-water investigations in New York State. In addition to these duties, he has had several special assignments in other parts of the country. In

1928 he served as consultant on investigations of stream-gaging possibilities in the lower Mississippi basin, and the following year was a member of a committee to allocate power profits at Minidoka Dam, Idaho. During 1933 he was on the President's Technical Committee on Water Flow, and in 1934 the New York State Planning Board appointed him a member of its Water Resources Committee.

Mr. Harrington became a Junior in the Society in 1910, an Associate Member in 1913, and a Member in 1925. From 1938 to 1940, while serving as Director representing District 3, he was on both the Membership Qualifications Committee and the Committee on Professional Conduct. During his third year he was chairman of the latter committee. In 1944 he served as president of the Mohawk-Hudson Section.

Mr. Harrington is a registered professional engineer and land surveyor in New York State. In addition to having written various technical articles and reports, he is the author, with Nathan C. Grover, of *Stream Flow*, published in 1943. His affiliations include membership in the Albany Society of Engineers (president, 1941), the National Society of Professional Engineers, the Cornell Society of Engineers, the Engineering Institute of Canada, the Federal Business Association of Albany (president, 1933), the American Veterans Association, Military Order of the World Wars, and the University Club of Albany.

J. T. L. McNew

A SPECIALIST in engineering education, J. T. L. McNew has spent much of his career in his native state of Texas. He was born at Belcherville on January 20, 1895, and graduated in civil engineering from the Agricultural and Mechanical College of Texas, receiving both the bachelor's and master's degrees. In 1925 he was awarded the degree of Civil Engineer by Iowa State College.

J. T. L. McNew
Nominee for Vice-President, Zone IV

Since 1920 he has been a member of the staff of the Agricultural and Mechanical College of Texas, having served in the positions from instructor to professor of highway engineering. From 1940 to 1945 he was head of the department of civil engineering, and since his return from service in the U.S. Army in early 1945, he has served as vice-president for engineering.

Mr. McNew is a veteran of both the first and second World Wars. He served as a second lieutenant, Corps of Engineers, in an engineer regiment in France and Germany in World War I, and in World War II he was a lieutenant colonel on the staff of the Air Engineer in the China-Burma-India Theater, which was concerned with ground installations for combat and cargo aircraft in India, Burma, and China. During his many years in the field of engineering education he has had many professional engagements with cities and counties in Texas.

Affiliating with the Society as an Associate Member in 1924, Mr. McNew became a full Member in 1929. He has served as chairman of the Society's Committee on Juniors and of its Committee on Local Sections, and from 1943 until 1945 he was a member of the Board of Direction as Director for District 15. He has also been active in the Texas Section, having served as secretary-treasurer from 1928 to 1937 and as president in 1938.

Mr. McNew is a member of the American Society of Mechanical Engineers and of the Society for the Promotion of Engineering Education and holds Engineers' License No. 10 in Texas.

Shortridge Hardesty

MANY of the notable bridge structures in the United States have been designed and built by Shortridge Hardesty's firm. Born in Weston, Mo., on September 13, 1884, he graduated from Drake University at Des Moines, Iowa, in 1905 with the A.B. degree. He then attended Rensselaer Polytechnic Institute, receiving the degree of C.E. in June 1908. Mr. Hardesty entered the office of Waddell & Harrington in Kansas City, Mo., in 1908, and became designing engineer in the firm of Waddell & Son in 1916. He came to New York City in 1920 with Dr. Waddell, in active charge of the latter's work in connection with the design and construction of a large number of bridges. In 1927 he became Dr. Waddell's partner in the firm of Waddell & Hardesty, and after Dr. Waddell's death in 1938 continued the firm's engineering practice under the name of Waddell & Hardesty. In June of the present year he formed the partnership of Hardesty & Hanover with Clinton D. Hanover, Jr., the partnership taking over the practice of Waddell and Hardesty.

SHORTRIDGE HARDESTY
Nominee for Director, District 1

Mr. Hardesty's important bridge work has included the Goethals and Outerbridge cantilever bridges across the Arthur Kill for the Port of New York Authority; the Cooper River cantilever bridge at Charleston, S.C.; the Mississippi River cantilever bridge at Cairo, Ill.; the Anthony Wayne suspension bridge at Toledo, Ohio; the Hudson River lift bridges at Albany and Troy; the North and South Grand Island Bridges over the Niagara River; 11 vertical lift spans over Newark Bay and the Hackensack and Passaic rivers for the Pennsylvania Railroad, the Central Railroad of New Jersey, and the Delaware, Lackawanna & Western Railroad; the lift span over Suisun Bay for the Southern Pacific Railroad; the Rainbow Arch Bridge over the Niagara River at Niagara Falls (the longest fixed-ended arch span); and the Marine Parkway Bridge over Rockaway Inlet (the longest highway vertical lift span).

At present his firm is engaged on the design of the Cross-Bronx Expressway and the Van Wyck Expressway in New York City for the State Department of Public Works; the Atlantic Beach Bridge for the Nassau County Bridge Authority; the Captree Bridge for the Jones Beach State Parkway Authority; and the Passaic River Bridge for the New Jersey State Highway Department. Mr. Hardesty designed the structural frames of the Trylon and Perisphere for the New York World's Fair; and has made extensive studies relative to the design of structural, mechanical and electrical features of movable bridges, long-span cantilever, arch, and suspension bridges, fatigue, and the application of light-weight floors, alloy steels, and structural aluminum to bridge design and construction.

He has been for many years a member of the Committee on Iron and Steel Structures of the American Railway Engineering Association, and has taken an active part in important studies relative to bridge design made by that Commiteee. He is also chairman of a newly formed Column Research Council, which has been organized under Engineering Foundation to study and harmonize the design of metal compression members. From 1936 to 1938 he was a member of the Council of the American Institute of Consulting Engineers. He was chairman of the Executive Committee of the Structural Division of the Society in 1941, and has been a director of the Metropolitan Section for the past three years.

His other affiliations include membership in the American Society of Testing Materials, the Society of American Military Engineers, the American Concrete Institute, the American Toll Bridge Association, and the International Association for Bridge and Structural Engineering; associate membership in the American Railway Engineering Association; and honorary membership in the Rensselaer Society of Engineers. He is also a member of Sigma Xi, Tau Beta Pi, and Phi Beta Kappa fraternities. He received the Society's Norman Medal in 1940 and the Thomas Fitch Rowland Prize in 1942, and the degree of LL.D. from Drake University in 1928.

Irving V. A. Huie

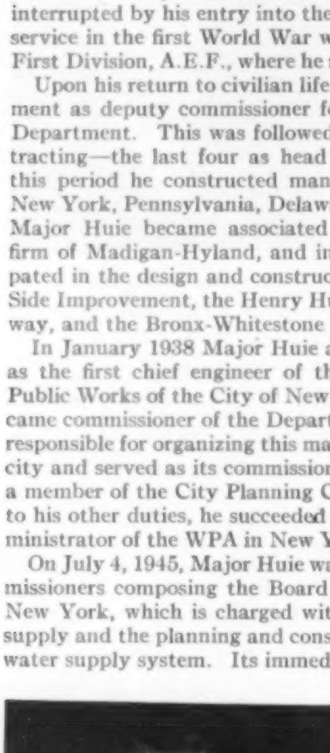
IRVING V. A. HUIE is that rarity, a native New Yorker, having been born in Brooklyn, N.Y., on March 8, 1890. He received his

engineering education in New York University, graduating with the degree of bachelor of science in civil engineering in 1911. For five years following graduation he was in the office of F. A. Molitor, consulting engineer, whose specialty was railroads. Mr. Huie was an engineer on construction in charge of the temporary underpinning of a section of the Seventh Avenue subway for the Rapid Transit Subway Construction Company. This engagement was interrupted by his entry into the armed forces in 1917. His entire service in the first World War was with the First U.S. Engineers, First Division, A.E.F., where he rose to the rank of major.

Upon his return to civilian life Major Huie accepted an appointment as deputy commissioner for the New York State Highway Department. This was followed by ten years in the field of contracting—the last four as head of his own organization. During this period he constructed many important highway arteries in New York, Pennsylvania, Delaware, and North Carolina. In 1931 Major Huie became associated with the New York consulting firm of Madigan-Hyland, and in the ensuing seven years participated in the design and construction of such projects as the West Side Improvement, the Henry Hudson Parkway, the Marine Parkway, and the Bronx-Whitestone Parkway.

In January 1938 Major Huie accepted an appointment to serve as the first chief engineer of the newly created Department of Public Works of the City of New York. In December 1938, he became commissioner of the Department. Major Huie is principally responsible for organizing this major engineering department of the city and served as its commissioner until July 4, 1945. He is also a member of the City Planning Commission. In 1941, in addition to his other duties, he succeeded Gen. Brehon B. Somervell as administrator of the WPA in New York City.

On July 4, 1945, Major Huie was appointed one of the three commissioners composing the Board of Water Supply of the City of New York, which is charged with the location of new sources of supply and the planning and construction of additions to the city's water supply system. Its immediate task is the completion of the Delaware water supply project, which will practically double the amount of the present supply. At the Board's first meeting after his appointment, Major Huie was elected president.



IRVING V. A. HUIE
Nominee for Director, District 1

During the recent war he was a member of the Mayor's War Cabinet, and he organized and commanded the Public Works Emergency Division, an important branch of the city's civilian defense.

Admitted to Junior membership in the Society in 1913, he was elected Associate Member in 1916, and Member in 1931. He has served the Metropolitan Section as a member of the Board of Directors since 1939, as vice-president (1941–1943), and as president (1943–1944). He is a member of the American Institute of Consulting Engineers and is, at present, on the Council of that organization, having also served as vice-president. He is a member of the Municipal Engineers, City of New York, and also an honorary associate member of the American Institute of Architects, New York Chapter.

ALBERT HAERTLEIN

ALTHOUGH Albert Haertlein is a native of Illinois (he was born in Alton on August 9, 1895), his childhood was spent in St. Louis, Mo., where he prepared for college in the public schools. He received the degree of bachelor of arts from Harvard College in 1916 and the degree of bachelor of science in civil engineering from Harvard University and from the Massachusetts Institute of Technology in 1918. During the first World War he served with the American Expeditionary Forces in France as second and first lieutenant, successively, in the Corps of Engineers of the Regular Army.

Following release from the Army in 1919, he spent four years as an instructor at the Harvard Engineering School and also as assistant to the late Prof. George Fillmore Swain, Past-President and Honorary Member of the Society. Between 1923 and 1928 he was an engineer for Dwight P. Robinson and Company, of New York.

Photographed by Bachrach

ALBERT HAERTLEIN
Nominee for Director, District 2

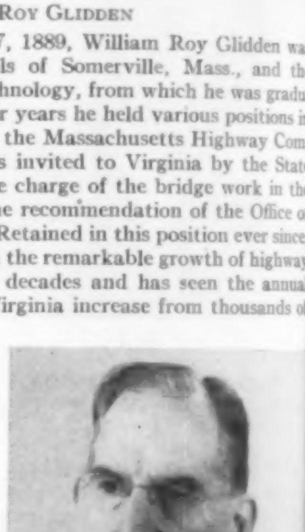
In 1928 he returned to Harvard University as a lecturer in civil engineering and was appointed associate professor of civil engineering in 1929. Since 1940 he has been Gordon McKay Professor of Civil Engineering.

He became a Junior in the Society in 1920, Associate Member in 1923, and Member in 1930. He was president of the Northeastern Section of the Society in 1937; president of the Boston Society of Civil Engineers in 1941; and president of the Engineering Societies of New England in 1945. Professor Haertlein is a fellow of the American Academy of Arts and Sciences and a member of the American Concrete Institute, the American Society for Testing Materials, the American Railway Engineering Association, the American Welding Society, and others. He is also a member of the Board of Registration of Professional Engineers and Land Surveyors in the Commonwealth of Massachusetts, having served since the board was first organized in 1942.

WILLIAM ROY GLIDDEN

BORN in Boston on March 7, 1889, William Roy Glidden was educated in the public schools of Somerville, Mass., and the Massachusetts Institute of Technology, from which he was graduated in 1912. For the next four years he held various positions in New England, principally with the Massachusetts Highway Commission. Then in 1916 he was invited to Virginia by the State Highway Commissioner to take charge of the bridge work in the Highway Department, upon the recommendation of the Office of Public Roads in Washington. Retained in this position ever since, Mr. Glidden has participated in the remarkable growth of highway construction of the past three decades and has seen the annual appropriations for bridges in Virginia increase from thousands of dollars to millions.

He has contributed to the evolution of highway bridge engineering during the past generation through his own practice and through membership on various technical committees. He has long been an active member of the Committee on Bridges and Structures of the American Association of State Highway Officials and of a similar committee in the Southeastern Association of State Highway Officials, and has served on committees acting jointly with the American Railway Engineering Association in matters relating to bridges. Mr. Glidden is also well known as a lecturer on engineering subjects at the institutions of higher learning and at engineers' clubs in Virginia.



WILLIAM ROY GLIDDEN
Nominee for Director, District 6

He is certified as a professional engineer in the state of Virginia, and by invitation has acted as consultant on special problems to other engineers and architects in the state. For many years he was on the engineering faculty of the Virginia Mechanics Institute and has taught special classes under the auspices of the Virginia Polytechnic Institute and the University of Virginia.

Mr. Glidden was elected a Member of the Society in 1922. During the past five years he has served as a member of the Board of Directors of the Virginia Section, and for one year of this period was president. He has taken an active part in the planning of Section functions and has prepared numerous papers for Section meetings.

William McKinney Piatt

A consulting engineer of many years standing, William McKinney Piatt has devoted much of his time to municipal engineering problems. He was born at Tunkhannock, Pa., on October 13, 1879, and attended private and public schools in his home town and Lafayette College, from which he graduated with honor in 1899 with the degree of E.E. He received the honorary M.S. degree in absentia from Lafayette in 1902, and the honorary degree of D.Eng. from the University of North Carolina in 1938.

William M. Piatt
Nominee for Director, District 10

Following his graduation in 1899, he joined the staff of J. L. Ludlow, M. ASCE, a municipal engineer, with offices at Winston-Salem, N.C. He remained there until 1910, at which time he entered into a partnership with Gilbert C. White, M. ASCE, at Durham, N.C. At the end of a year the partnership was dissolved, and since then he has carried on a general engineering practice with offices in Durham, N.C. He has acted as consulting, designing, and supervising engineer, specializing in water supply and sanitation, streets, power plants, reports, and appraisals for upwards of 100 cities and towns in North Carolina and adjacent states.

From 1940 to 1943 he was co-architect-engineer, in direct charge of construction for the U.S. Army, of Camp Davis at Holly Ridge, N.C.; Camp Butner, at Durham, N.C.; and an Air Force Replacement Center at Greensboro, N.C. In addition, during this period, he was consultant on water supply and sewerage for Fort Benning, Ga. During 1943 and 1944 he served as state adviser for sanitary engineers for the War Manpower Commission; and from 1936 to 1943 as water consultant to the National Resources Committee and its successor, the National Resources Planning Board. He is a member of the National Panel of Arbitrators of the American Arbitration Association.

Mr. Piatt became a member of the Society in 1926. He is also a member of the American Institute of Consulting Engineers; the American Institute of Electrical Engineers (life member and fellow); the American Water Works Association; the Federation of Sewage Works Associations; the American Public Works Association; and the North Carolina Society of Engineers. He is a past-president of the North Carolina Section of the Society, the North Carolina Society of Engineers, and the Durham Engineers Club; past-chairman of the North Carolina Section of the American Water Works Association, and the North Carolina Sewage Works Association; and director of the North Carolina Engineering Foundation, Inc.

Mr. Piatt was the recipient of the Annual Certificate for Outstanding Engineering Achievement from the North Carolina Society of Engineers for 1937, and of the George W. Fuller Award of the North Carolina Section of the American Water Works Association for 1943. He is at present (1943 to 1946) serving a term as director of the American Water Works Association, and is on several committees of that organization. Other affiliations include membership on the Development Committee of the American Institute of Consulting Engineers and the Code of Principles Committee of the American Institute of Electrical Engineers.

Frederick W. Panhorst

A specialist in the design of highway structures, Frederick W. Panhorst has been with the California State Division of Highways for a number of years. He was born in Mexico, Mo., on March 14, 1893, but spent his early years in Illinois, attending high school at Staunton. In 1915 he graduated from the University of Illinois, where he received his B.S. in civil engineering and, later, his C.E. degree. His early experience included railroad bridge and mill building design. Two years after graduation he went west as an engineer in the Puget Sound Navy Yard at Bremerton, Wash., and in 1920 he was in Montana working on mill building design for the Anaconda Copper Mining Company. From 1921 to 1927 he was in charge of the construction of numerous large bridges for the State Highway Department of Washington.

Frederick W. Panhorst
Nominee for Director, District 13

In 1927 Mr. Panhorst went to California as bridge construction engineer for the State Division of Highways. In 1931 he was appointed acting bridge engineer and, since 1936, he has been bridge engineer, responsible for the design and construction of all bridges and structures in the state highway system. He has consistently advocated and practiced the modern design of highway structures.

Mr. Panhorst became an Associate Member of the Society in 1923 and Member in 1933. In 1944 he was elected to the Executive Committee of the Structural Division. He has been active in Local Section affairs, and was president of the Sacramento Section in 1939, and for the past three years has been chairman of the Local Membership Committee for that area.

His other affiliations include membership in the American Association of State Highway Officials (and membership on its Bridge Committee); the American Road Builders Association; the International Association for Bridge and Structural Engineering; the American Concrete Institute; and the Structural Engineers Association of Northern California. He is a registered civil engineer and structural engineer in California.

A Twice-Told Tale Still True

At a hearing before the joint meeting of a Senate Subcommittee on Commerce and Military Affairs held in Washington, D.C., an engineer made some pertinent comments regarding engineers in general.

At the hearing on November 2, 1945, Morris L. Cook, not a member of the Society, but identifying himself as a "consulting engineer in management," with residence in Philadelphia and in Washington, D.C., had this to say regarding engineers and their apathy toward public questions:

"Speaking now for myself may I say that it would seem unwise to consider this legislation without having in mind the attitude of the great majority of scientists toward the world in which they live. The relationship which scientists—and engineers too—bear to the hurly-burly of American life, including its politics, is difficult for those outside these professional fields to understand. The scientists, as a matter of fact, are themselves only dimly aware of how detached they are, individually and as a profession, from the pulsating world around them.

"In the days when science was persecuted, the scientist was a recluse living as far as possible from the haunts of men. He still lives a life apart, sharing almost not at all in our common activities, and assuming no responsibility for the conduct of affairs outside the narrow confines of his own professional interest. Decisions dictated by slide rules and test tubes are his daily meat. Labor unions, and especially politics, are anathema. The settlement of issues by the give-and-take involved in democratic compromise seems too crude in comparison with determinations reached by the 2-plus-4 method of mathematics. Scientists and engineers, with few exceptions, feel no responsibility whatever for the life of the community—the hospitals, the school system, the boys' clubs, the

forums for the discussion of public questions, the homes for the aged. Statistical proofs of this situation are multiplying.

"Among over one hundred rather outstanding citizens associated with the management of the American Civil Liberties Union, there is one engineer and one scientist. Among over three hundred scientists and engineers belonging to a distinguished social organization choosing a considerable part of its membership with some care from among these groups, only five were found to be associated with social agencies.

"Notwithstanding that peace is the world's most absorbing concern, the lists of those responsible for the management of local and national agencies seeking to promote the cause of peace indicate almost no participation by engineers or scientists. Among the nearly two hundred names on the board of directors and the National Committee of Americans United, our most representative and inclusive organization working for peace, no member of either group is to be found.

"An even more significant indication of our absorption in our own technical affairs is the fact that among over forty organizations selected to aid our government during the recent United Nations Conference at San Francisco, scientific and engineering groups were totally absent. These groups comprised religious, educational, labor, legal, agricultural, racial, business, and social organizations, and the latter included Rotary, Kiwanis, and Lions. There was one engineer and one scientist among about four hundred individual consultants and advisers officially chosen from among a wide variety of callings, and each seeking to do their bit at San Francisco."

National Research Foundation Limited to Basic Sciences Favored by Engineers' Panel

Scope and Control of Research Activities Outlined Before Congressional Committee

Legislation establishing a National Science Research Foundation has been the subject of study by Congressional committees. In the Senate, Bills 1285 and 1297, with attendant legislation, have been given special consideration. At a hearing before the investigating Senate committee on October 26, 1945, a panel of appointees of five major engineering societies presented a statement outlining the interests of the societies in organized research programs and suggesting the relationships to be recognized in drawing up legislation. As this statement goes to press, no action has been taken on any of the bills being considered. The full statement of the panel is printed here.

This statement is submitted on behalf of a special panel of appointees from the five major National Engineering Societies, viz.:

The American Society of Civil Engineers
The American Institute of Mining and Metallurgical Engineers
The American Society of Mechanical Engineers
The American Institute of Electrical Engineers
The American Institute of Chemical Engineers

The panel was appointed by action of the Engineers Joint Council, a body composed of the head executives of the aforesaid societies, the aggregate membership of which approaches seventy-five thousand qualified American engineers. The Engineers Joint Council, at whose behest the panel presents its views, constitutes thus the crowning body of the organized American engineering profession as a whole.

ENGINEERS are vitally interested in basic scientific research, for such research is the foundation of modern engineering. In fact, the position and role of the Engineer in the human community is that of an active link between basic scientific research and technology. It is the Engineer who makes use of the fruit of scientific progress and turns it to the practical service of man. Applied research is actually planned and carried out by the Engineer. That is his recognized field. However, the Engineer is directly concerned with, and actively engaged in, basic scientific research. Indeed, recent progress of technology has grown out of an unprecedented development of engineering science, meaning a fundamental knowledge of the laws of nature which permit the mastery of the resources and powers of nature. The significance of engineering science in present society is best illustrated by the example of Germany, which was the first country to recognize the vital importance of basic engineering research. The result was the miraculous technical achievement of which the world has been the recent witness, and of which humanity came so near becoming a victim.

In many ways the practicing engineer bears the same relationship to fundamental research in the science of engineering as does the practicing physician to the basic investigations of the scholarly doctor in the medical and biological fields. The practicing engineer applies the basic principles discovered by engineering science to technological problems, just as the practicing physician uses scientific discoveries for healing the sick.

In presenting the viewpoint of the engineering profession, which may rightfully consider itself as particularly expert in appraising the value and portent of scientific research, the undersigned panel unreservedly endorses the broad objects of the proposed legislation in regard to basic scientific research. The Engineering Profession stands undivided back of the words of the President, that

> "Progress in scientific research and development is an indispensable condition to the future welfare and security of the nation."

Furthermore the circumstances under which this country is facing the problem of promoting basic scientific research are unprecedented and are marked by pressing urgency. By the force of events growing out of the war, the United States has been thrust into a position of preeminent leadership in world affairs. It is incumbent on us to continue to preserve and maintain this leading part from this time forward. We must be prepared for any military eventuality. War has become a battle of scientists. Also this country must lead in science to assure national health, prosperity and welfare. As the President stated:

> "No nation can maintain a position of leadership in the world of today, unless it develops to the full its scientific and technological resources."

The American people have been foremost in technical ingenuity and industrial organization, and in research of "applied" character. It is a well-acknowledged fact, on the other hand, that in the realm of basic sciences and basic scientific research the United States did not keep pace with the principal nations of the Old World. Indeed, to a large extent practical applied research in the United States relied on basic scientific material coming from overseas. The war has violently upset this balance. Europe is in eclipse. For years to come, in the intellectual and scientific realm the United States will have to depend on its own resources. This brings this country face to face with a problem of utmost gravity. Under the threat of losing its primacy the United States "must" speedily fill the void left open by the ravages of Europe, and within the shortest allowable period bring up its own scientific research to a level which, in scope and quality, will measure up to the requirements of this country's new world position.

SCIENTIFIC RESEARCH MUST BE FOSTERED

It is self-evident that the size and the urgency of the problem are such that scientific research in this country no longer can be allowed to depend on the course of natural development that prevailed in the past, and to rely upon the diminishing funds of private philanthropy. A systematic and generous yearly appropriation of government funds becomes a necessity. Under such circumstances the Engineering Panel joins its voice to the universally endorsed proposal of a special National Foundation for promoting and developing basic scientific research.

The situation indeed bears a resemblance to that at the beginning of the war, when the country was called upon to build overnight a war industry capable of meeting the most formidable threat of all time. However, the conversion of our peacetime industry to war was largely a problem of material reorganization, while the present problem of bringing to life and stimulating creative, scientific

endeavor largely lies in the spiritual and intellectual realm. Indeed, the delicacy of the problem requires the most careful and considerate approach. Methods must be chosen which would assure an optimum and most speedy development. It is equally imperative to abstain from measures which could impair or stultify the sought-for objective.

In formulating the following opinions, the undersigned Engineering Panel is motivated by the desire to find the best possible solution for a problem of highest national importance:

a. The primary purpose of the proposed Foundation should be basic scientific research. It is in this realm that the United States has been lagging behind. As a general principle, the Foundation should not spend government funds for research in fields which have been obtaining, and will continue to obtain, financial support from other sources. Accordingly there is no need for the Foundation to support "applied" research. Indeed, experience has shown that adequate funds and means were readily found in the past for research of applied practical character. Also there are many research men and organizations, in the field of technology and applied sciences, that are well supported by industry and partly by special public agencies for the purpose of developing new products and processes for business concerns of all sizes. Federal aid, on the other hand, is sorely needed and should be generously provided to enhance and support basic scientific research. The latter obviously is the foundation for practical applied advancement. But basic research in itself bears the distinction of being undertaken without any immediate idea of profit. The results are to be of service to humanity at large.

Index for 1945 Volume of "Civil Engineering" in This Issue

All articles and items appearing in Volume 15 (1945) of CIVIL ENGINEERING are included in the index at the very back of this issue. This index is purposely printed in a separate form so that it can be easily removed and placed in any position when the volume is bound.

Separate copies of the index are available on request to Headquarters at 15 cents each.

b. It is the view of this panel that basic scientific research necessarily implies fundamental research in the engineering sciences. Although none of the proposed legislative proposals has so far deigned to mention engineering research by name, we feel that it is unnecessary as well as impractical to enumerate the different ramifications of science in the proposed Legislative Act. Research in the sciences should mean that the Foundation will promote basic scientific work on all possible lines, recognizing fundamental engineering research as one of its major objectives.

c. In the opinion of this panel no useful purpose will be served by extending the scope of the Foundation to embrace "social sciences." The engineers in their wide contacts with "men," keenly appreciate the value and significance of better social understanding. The character of the problems, however, is essentially distinct from those dealing with the physical world. Social studies should be the object of a separate agency composed of an altogether different type of man. Placing social sciences under the same roof with natural sciences will help neither and impede both.

d. In discerning the ways and means by which optimum progress in basic scientific research can be achieved, the undersigned panel wholeheartedly ranges itself back of the words of the President, that:

> "Science can be coordinated and encouraged, it cannot be dictated to or regimented. Science cannot progress unless founded on the free intelligence of the Scientist . . . the Federal Research Agency . . . should in no way impede that freedom."

In deciding upon the preferred form of organization and on the modes of functioning of the Foundation, this panel is guided by the conviction that progress in science is essentially a matter of free and uninhibited display of creative scientific endeavor. Accordingly, any plan intended to call to life and promote basic scientific research must devolve from the aim of providing a propitious atmosphere, in which creative human talent will assert itself to supreme advantage. Reduced to practice, the problem is to select scientists endowed with creative capacity and to place them in an environment where, with proper material support, scientific talent will thrive and bear fruit.

With regard to the form of organization, the essential feature is to place the Foundation in the hands of men competent and experienced in scientific research, and removed from all possible partisan or commercial influences. The type of organization, proved by the example of the large universities, the National Advisory Board for Aeronautics, and the numerous privately endowed non-profit institutions, is the American democratic method of group control as distinct from centralized authority exercised by a single official. The undersigned panel decidedly expresses its preference, therefore, for the type of structure reflected in the Magnuson Bill S. 1285, which vests supreme control of the Foundation's affairs in a board, the members of which are chosen without regard to political or partisan affiliations and solely on the basis of their demonstrated interest, experience, and competence in matters of research.

Research, by its very nature, requires a "climate" different from the technical formalities attendant on customary government routine. The Foundation should be given the widest authority to prescribe its own specific rules and regulations and to administer affairs in forms appropriate to the purpose of advancing basic sciences, and outside the usual bureaucratic routine.

e. A Foundation of the size and scope contemplated will obviously require a strong and efficient executive structure. Accordingly, the Director should possess the broadest powers to insure promptness and efficiency in operations. But in his capacity as Chief Executive the Director should function under the general control of the board and should be responsible to the latter.

The board should consist of men representing different ramifications of science, and should be selected from panels submitted by the leading national scientific and professional associations. The board should necessarily include members representative of engineering. Engineering scientists should also be appointed to the different committees, which are to govern the work of the divisional substructure. The board should be left free to seek recommendations for committee appointments from appropriate scientific and professional associations. No single body should be privileged by legislative acts to offer such recommendations.

f. The most crucial problem is that of men. There is need for scholars capable of creative leadership and for adequate staffs of scientifically trained personnel. The supply of such personnel has been diminishing in recent years and shows no prospect of immediate renewal. There is no way to provide for such personnel in the future except by generously appointing promising candidates to fellowships and scholarships. The training of such future scientific personnel must be raised to the highest possible level, commensurate with the requirements of the day. To achieve this purpose, and to procure in the shortest time an adequate host of properly trained men, may require policies and procedures in the way of fellowships and stipends which might substantially depart from previous practices and would boldly cut across routine. The Foundation should be given the broadest possible freedom of action in this respect.

The natural seat for the training of personnel is the universities. Except for a few privately endowed non-profit institutions and certain Government laboratories, the universities will also be the natural center for basic scientific research. By contrast to the Old World prototypes, where for centuries the universities flowered as centers of creative scientific activity, the American university in the past principally served the purpose of mass instruction. The duties connected with teaching left no time and opportunity to the academic personnel for scientific research and advancement. Under the stress of the new national requirements the climate of university life will necessarily have to change. The Foundation in its policy of contracts and subventions should be free to exercise such powers as will allow University Research to be located in surroundings where the scientifically minded staff will be able to devote the necessary time and effort to scientific pursuits free from the consuming burden of academic routine.

g. In laying emphasis on basic scientific research as the prime objective of the proposed Foundation, this panel fully recognizes the fact that it is not always possible to draw the delimiting line

between basic and applied pursuits. It is obvious, on the other hand, that all such activities as experimental researches looking to the development of new or the improvement of existing processes and devices, or the preparation of plans, specifications, standards, economic and industrial studies, or the experimental operation of pilot plants should not be included in the function of the Foundation. These most necessary and useful activities are the proper function of private industry, industrial research laboratories, engineering organizations, and the appropriate federal, state, or municipal agencies. A National Research Foundation should not only refrain from duplicating such activities, but should not utilize its facilities or energies for the immediate commercial advantage of any group of citizens. On the other hand, the work of the Foundation will ultimately aid all practical endeavor by extending the limits of basic knowledge and by increasing the supply of men trained for research.

h. An essential condition to the success of a Foundation dedicated to the advancement of basic sciences, is to divest such Foundation from all duties and functions which are essentially alien to the spirit of free scientific pursuit. A most important instance of this character is the question of patents. The subject of patents is highly controversial. Patents have been qualified by some as "the life of research." Others are inclined to consider the very idea of patent protection as "an embodiment of monopoly." This panel understands that the whole subject of future national patent policies is in the process of consideration by special legislative agencies. In view of this fact and pending the forthcoming patent legislation, a Foundation dedicated to basic scientific research should be held free from any connections with predetermined patent policies. Moreover, patents have to do primarily with applied or industrial research, as distinct from the basic scientific research with which the Foundation should be concerned. If the Foundation is properly set up for the object of advancing basic sciences, the question of patents will not be serious, and in rare, exceptional instances, could be properly handled under the provisions of the general patent law through appropriate contractual relationships determined by the Board.

SUMMARY OF CONCLUSIONS

1. The development of basic scientific research on a scale commensurate with the dominant position of the U.S.A. is a problem of pressing national necessity. The magnitude and urgency of the task make indispensable government support of such research through a National Research Foundation.

2. Federal funds, administered by the Foundation, should be allocated for purposes where government support is indispensable, and should not be diverted to fields where research may rely on other sources. The proposed National Research Foundation should promote basic scientific research only, leaving applications to industrial and technologic practices to the appropriate private, industrial and public agencies.

3. Basic scientific research should include fundamental research in engineering sciences.

4. Social studies should be the object of a separate agency.

5. The preferable form of organization is to have control of the Foundation vested in a Board appointed solely on the basis of scientific competence, and outside of any partisan or political consideration. The Director of the Foundation should be selected by the Board and be responsible to the latter.

6. The Foundation should be given the broadest authority to enact its own rules and regulations in all matters concerning basic scientific research, in subsidizing the training of future research personnel, and in matters of publication.

7. Engineering science should be recognized in the forming of the Board and the divisional substructure.

8. The Legislative Act establishing the Foundation should be confined to the sole purpose of advancing basic science and should not include controversial legislation dealing with patents.

Respectfully submitted by the aforementioned panel appointed by action of the Engineers Joint Council.

BORIS A. BAKHMETEFF, *Chairman*
Honorary Member, American Society of Civil Engineers

DR. HARVEY S. MUDD
President, American Institute of Mining and Metallurgical Engineers

F. MALCOLM FARMER
Fellow and Past-President, American Institute of Electrical Engineers

PROF. A. G. CHRISTIE
Past-President, American Society of Mechanical Engineers

DR. GEORGE GRAINGER BROWN
Past-President, American Institute of Chemical Engineers

Three New Honorary Members

AT ITS October meeting in Chicago, the Board of Direction of the Society awarded Honorary Membership to three engineers eminent in their respective fields. They are Boris A. Bakhmeteff, Charles F. Kettering, and Charles H. Purcell.

Born in Tiflis, Caucasus, Dr. Bakhmeteff received his technical education mainly in Zurich and St. Petersburg. From 1905 to 1916, he was at the Polytechnical Institute Emperor Peter the Great in St. Petersburgh, where he served as assistant professor and professor. In 1911 he received a degree corresponding to our doctor of engineering. In this period he was also connected with several major projects, including the Dnieper project, on which he was chief engineer. From 1917 to 1922 he was ambassador to the United States in Washington, D.C. Since 1923 he has maintained a consulting practice in New York, and since 1931 has been Professor of Civil Engineering at Columbia University. He is the author of numerous articles on his specialty, hydraulics, and of several books.

Charles F. Kettering, inventor and manufacturer, has been for many years Vice-president and Director of the General Motors Corporation, and President and Director of the General Motors Research Corporation. Early in his career, together with Edward A. Deeds and other capitalists, he organized the Dayton Engineering Laboratories (Delco) for the purpose of manufacturing one of his most important inventions, the Delco starting, lighting, and ignition system for automobiles, which has since been utilized all over the world. Other of his inventions include the Delco-Light farm lighting system and the ignition system used on Liberty Motors. The list of his inventions is a long one. He is a Fellow of the National Academy of Sciences, and has received honorary doctor's degrees from several universities, including his alma mater, Ohio State University.

As for the third new Honorary Member, Charles H. Purcell, his main field of achievement has been structural design. He is a graduate of Stanford University and received his bachelor of science degree in civil engineering in 1906 from the University of Nebraska. Following ten years with the U.S. Bureau of Public Roads as Assistant and District Engineer supervising the expenditure of federal money for highways and bridges, in 1928 he became California's State Highway Engineer. In this position he was responsible for the spending of an annual budget of fifty million dollars. In 1931 he became Chief Engineer of the San Francisco-Oakland Bay Bridge, a $77,000,000 project. Since 1943 his title has been Director of the California State Department of Public Works, consisting of the Divisions of Highways, Water Resources and Architecture.

A more complete account of the accomplishments of these notable engineers, all members of the Society, will be given in a later issue of CIVIL ENGINEERING. The formal award of Honorary Membership in the Society will be made at ceremonies in connection with the Society's Annual Meeting, to be held in New York in January 1946.

Alfred Noble Prize to A. L. Ahlf

THE ALFRED NOBLE Prize for 1945 will be presented to A. L. Ahlf, Jun. ASCE, an associate engineer with the Bureau of Reclamation in Denver, Colo. The prize committee extended the award in recognition of the paper, "Design Constants for Beams with Non-Symmetrical Straight Haunches," written by Mr. Ahlf and published in the PROCEEDINGS of the Society for October 1944. The prize will be presented at the Annual Meeting in January.

Established in 1929, the Alfred Noble Prize was made possible by a fund contributed by friends of Mr. Noble, one-time President of the American Society of Civil Engineers. The prize is awarded annually to a young member of one of the four Founder Societies or the Western Society of Engineers for a published technical paper of exceptional merit.

Timing Public Works to Stabilize the Construction Industry

The Public Works Construction Advisory Committee was established in April 1945 by Maj. Gen. Philip B. Fleming, Administrator of the Federal Works Agency, for the purpose of advising him of its views on matters of mutual interest to the Federal Works Agency and the national organizations represented on the Committee. It is wholly advisory in function, and is not concerned with details of public works programs or with the influencing of Congressional legislation. The organizations included on the Committee, and their representatives, are as follows:

E. L. Chandler, Chairman—American Society of Civil Engineers
Frank Bane—Council of State Governments
Paul Betters—United States Conference of Mayors
F. S. Fitzpatrick, Secretary—United States Chamber of Commerce
J. W. Follin—Producers' Council
H. E. Foreman—Associated General Contractors
R. J. Gray—Building and Construction Trades Dept. A.F. of L.
Hal. H. Hale—American Assoc. of State Highway Officials
E. E. Mallery—American Municipal Association
E. R. Purves—American Institute of Architects
M. X. Wilberding—American Society of Mechanical Engineers

Although the Committee has taken action on a variety of matters, the report to General Fleming entitled "Timing of Public Works Construction as a Measure for Stabilizing the Construction Industry," is the first statement of any magnitude issued by the Committee. It is here presented in abstract form.

Decision to adopt a policy of timing public works construction, with the objective of adding stabilization to the construction industry, should be reached only in the light of careful analysis of benefits to be expected. It is the purpose of this report to present such an analysis.

Our conclusions may be summarized as:

(1) Substantial good can result from a well-organized program for increasing the volume of construction during a period of depression by advancing the timing of sound public works projects that have been fully planned for ultimate construction although the immediate need for them may not be imperative.

(2) Relatively little reduction in total volume of construction is to be obtained at the crest of an up-swing in the economic cycle by deferring construction of public works.

(3) Completion of plans and preliminary arrangements for an adequate volume of local public works in advance of the need for them depends upon availability of funds for the purpose. We believe that the current policy of advancing federal funds, to be repaid when the work is undertaken, to local governmental agencies for the purpose of planning is helpful and that this program should be continued with adequate appropriations.

Relation of the Construction Industry to the National Economy

The construction industry contributes very substantially to the national economy. Based on figures of the Department of Commerce, new construction with its related business activities may be expected to account for approximately 12% of the total national economy. Including construction necessary for repair and maintenance, this will increase to something like 15%. Public work, on the basis of experience, constitutes approximately one-third of the total volume of new construction, or 4% of the national economy. However, the effect of construction in the life of the country is much greater than may be inferred from these percentages. Owing to the widespread and diversified character of construction, the industry is composed of a very large number of organizations, varying greatly in size and capacity. Construction, as such, is normally performed by contractors. Contracting organizations vary from small business establishments, which may have no more than a half-dozen employees and whose total volume of work frequently does not exceed $5,000 a year, up to large organizations whose annual operations run to many millions of dollars. Under prosperous, peacetime conditions, the number of construction contractors in the country has been well in excess of 200,000. These are widely distributed, one or more contractors usually being found in every community. The impact of this very considerable segment of our economy extends to every corner of the country.

Historically, the industry has experienced extreme fluctuations, far more pronounced than the upward and downward variations of the overall economy. From the nature of the industry, the good and evil effects of such fluctuations are widespread and direct.

In applying the term "stabilization" to the construction industry, it is not intended to imply stagnation or freezing of the total construction volume at any given level, either high or low. The contemplated objective is the adoption of measures, under our competitive economy, which may lessen the extremes of fluctuation that have characterized this great industry in the past.

The value of a construction program must not be judged primarily by the amount of money and material it uses or the employment it furnishes. The true worth of any project can be determined only by considering the long-range value of the facility constructed as compared with the amount of capital invested. Just as truly as with private investment, it is not economically sound to embark upon programs of public work construction unless they lead to useful and needed public structures. Benefits should justify costs.

If, as the result of some degree of stabilization, the construction industry could look to the future without a threat of extreme depression or over-expansion, there would be a multitude of beneficial results. With a reasonably steady, dependable volume of work, there should come increasingly better investment services. The foundation would be laid for sounder relations between employers and labor. Obviously there would be a lessening of periodic unemployment during depths of economic depression. Construction programs could be more intelligently planned. Construction costs would be more favorable. High prices for materials and labor and excessive overtime, which always develop during boom periods, would be avoided. A healthy, prosperous construction industry always will exert an important influence in maintaining the prosperity of the country.

Basis for Stabilization

Success in attaining any degree of stabilization will require ability to recognize the approach of a critically high, or low, level of activity, and determination to take steps to reverse the trend when responsible groups in the industry recognize that evil effects will result if it is allowed to continue unabated. Obviously, it always will be difficult to gain agreement as to the stage in a cycle at which it will be advisable to take steps to lessen the rate of expansion.

Comprehensive, currently maintained and readily available information on a wide variety of data bearing on construction in the fields of both public and private work forms the fundamental basis for an intelligent program of stabilization. There is a distressing lack of dependable information regarding the construction industry. Such statistics must encompass all phases of activity which affect the industry in all its component parts. Data must be available as to the volume of construction by types of project and location, as to current costs of construction, as to types and quantities of equipment available, as to such matters as traffic surveys and power consumption, and as to labor and materials. There should be authentic information as to trends of population, as to the financial status of the governmental agencies at all levels, as to real estate values and transfers, as to rental conditions with respect to all types of properties, as to tax rates and collections, and many other related matters.

With information of this nature available in some one federal agency, a foundation on which to base stabilization would be afforded. Intelligent interpretation of such statistics should make it possible to recognize an approaching saturation of construction demands.

Experience has shown that there is an unavoidable lag between the conception of any construction project and the time when construction can be started. Plans must be prepared, legal difficulties overcome, sites acquired, contracts let, and all of these steps are time consuming. Frequently, preparations for construction take longer than actual construction. This has an important bearing on the long-term problem of using public works to sustain construction activity. In order for public works construction to be effective as a means of stimulating the industry at a time when the trend of activity is downward, it is vital that projects be ready for prompt starting of construction. Hence, it is highly important that an adequate volume of projects be fully planned and ready for prompt initiation in time of emergency. Such projects should be

useful in character, and ultimately necessary, although the immediate need may not be imperative. With a continuing volume of such projects, normally scheduled for building from year to year over a period of three years, it would be feasible to advance the timing of some to swell the volume of construction.

Major federal projects such as those for flood control, drainage, irrigation, or harbor improvements constitute a large portion of the public works program. Generally these are not of immediate urgency and it should be possible to schedule them with some arbitrariness without serious adverse effect on the life of the country. Careful scheduling of public works with due regard to essentiality is of major importance in preparing programs for delay or advance in timing of construction.

The construction industry is very complex. It is the function of construction to supply necessary amounts of a wide variety of needed products of specific kinds in many fields. Each of these fields is an important segment in its own right as well as being a part of an important whole. Each must be kept in reasonable balance within itself. Stabilization of each, with due regard for its product, will be an essential consideration when seeking effectual stabilization of the whole. Otherwise there will be instability instead of stability.

Having in mind that the procedure cannot be simply a matter of turning public construction off or on promptly and at will, it is well to give consideration to such results as might be possible through the timing of public works. Both the effect on the construction industry and that on the national economy demand attention.

Starting with the assumption, justified by experience, that the construction industry will represent 12% of the national income during prosperity, and that public work of all classes may be expected to account for one-third of that proportion, it is enlightening to separate public work into some of its components. Federal programs, including federal aid to highways, are likely to account for 50% of total public works construction. The Federal Works Agency is likely to have either full or part control of the financing of 50% of the total federal work.

We find no justification for believing that the maximum result to be gained by retarding federally controlled construction could become more than a modest portion of total construction volume and, therefore, a very small percentage of the national economy. Reference to Table I will show that even on the ridiculously impossible assumption that all federal work could be halted, the result would represent only about 2% of the national income.

TABLE I. BREAKDOWN OF CONSTRUCTION INDUSTRY INTO COMPONENT PARTS

	Resulting Percentages	
Assumptions	Of Total Construction	Of National Income
Construction will account for	...	12
Public work will be	33.3	4
Federal share of public work will be 50%,* or . . .	16.7	2
FWA share of federal will be 50%, or	8.3	1
FWA can defer 50% of its share,† or	4.2	0.5

* This item includes federal aid to highways.
† The FWA deferrable portion becomes 50% × 50% = 25% of the total federal program, or 12.5% of total public construction.

The chief value of a policy of timing will be found in its effect as a stimulant during times of depression. Here again, in order to arrive at a conclusion, it is necessary to make some assumptions as to possible measures. It is reasonable to consider that the volume of federal public work during a depression might be increased to double that carried on during national prosperity. That never has happened, but we are contemplating conditions when preparation for the contingency would be far more adequate than ever before. Such expansion would be sufficient to offset a shrinkage of 25% of all private construction. That would be a substantial contribution, not only to the construction industry but to the national economy at a time when support and encouragement were sorely needed.

However, it is not to be anticipated that such stability can be maintained indefinitely. We find nothing to demonstrate that public work, even though swelled far beyond the volume indicated, can be expected to hold the grand total of construction at peak level throughout a severe depression.

The obvious conclusion is that suitable timing of federal public work may be counted on for substantial assistance in bolstering up a declining construction industry. It is unreasonable to expect it to contribute sufficiently to maintain a volume of construction equal to that anticipated during prosperous times, nor can it be used as a stabilizing panacea for controlling cycles of the overall economy.

This conclusion is not to be interpreted as indicating that stabilization of the construction industry is of minor importance. The very fact that effective steps were being taken to check a decline would bring confidence to the industry.

It is emphasized that all of the foregoing discussion is based on inclusion of none but substantial and useful public works. Construction of such undertakings creates approximately two jobs in off-site employment for every on-site job. On the other hand, make-work projects furnish on-site jobs but, in general, they create little or no employment for the durable goods industries that constitute a very important segment of the construction industry.

Without close cooperation on the part of administrators of several major agencies of the Federal Government, little success could be expected. It would be of little avail for the Federal Works Agency to readjust schedules for its part of federal work if the Bureau of Reclamation, the Corps of Engineers, the Civil Aeronautics Authority, and other agencies were not to follow a similar policy.

Assuming recognition of the need for action and that necessary preparation had been made, the timing of wholly federal projects could be carried out by direct orders from federal administrators. To a somewhat lesser degree, federal-aid programs could be adjusted in the same direct manner.

It is important that state and local governments contribute their share to stabilization. It would be more difficult to achieve satisfactory results in this field than at the federal level.

Being responsible for two-thirds of all construction, private industry must cooperate if the greatest good is to be accomplished.

DIFFICULTIES IN THE WAY OF STABILIZATION

It will not be an easy matter to achieve stabilization. Numerous obstacles are evident and, no doubt, other less obvious ones will develop. In itself, such a program entails some rather drastic changes in long-standing procedures. As with all innovations, there will be difficulty in overcoming the inertia of custom. Even though there may be some agreement that certain public works are postponable, it always will be difficult to convince any particular group or agency that its work is more deferrable than that of others.

Decision as to times when work should be deferred or advanced always will be difficult. Decision as to what constitutes a normal construction volume, or a maximum desirable level, will be a preliminary to any proposal to slow down public works construction. Perhaps agreement could be reached now as to a theoretical maximum safe level, but it is doubtful whether, at any particular stage of construction activity, there will be any unanimity of opinion that that particular level is a maximum safe one.

There will be difficulty in establishing the relative order in which specific projects should be withheld. As already mentioned, it will be only natural for each federal agency to contend that work for which it is responsible deserves high priority, and there will be reluctance on the part of one agency to slacken its own progress while others proceed. Again, advance in the timing of projects normally scheduled for later construction will largely hinge upon appropriation of funds by Congress to permit prompt starting of the work. Such action will be required at times when general business activity is declining and tax revenues are shrinking. Congress will be faced with the necessity for important decisions under difficult circumstances. Success will depend upon close relations and sincere cooperation between those agencies responsible for carrying out stabilization policies and the Congress.

Brief reference has been made to one specific and easily recognizable potential difficulty. Ability to initiate construction promptly is of the essence of the program if it is to be effective. It is essential to have in reserve a substantial volume of projects with regard to which all preliminaries have been cleared away.

Legal requirements frequently stand in the way. In many states and communities, specific legislative action is required to permit the building of desirable projects. If such an obstacle is not overcome in advance, it is impossible to embark upon a construction program with promptness. There may be difficulty in completing financial arrangements. Particularly during periods of depression, it may be found that a municipality will be unable to complete necessary financing for added public works construction because of outstanding indebtedness. Political implications are involved. If an administration has come into office with a pledge of carrying out specific public works development, or if, during its term in office, it has brought to completion all necessary arrangements for the con-

struction of worthy projects, it is not likely that such undertakings will be deferred willingly with a possibility that they may be constructed later during the administration of an opposition party.

It is generally true that legislative restrictions prohibit local governments from making expenditures for complete planning of public works in advance of the issuance of bonds for construction. Under such conditions, it becomes impossible to provide a shelf of planned projects at the local level. Congress acted constructively in this matter when it made provision, under Title V of the War Mobilization and Reconversion Act of 1944, to advance federal funds to local governmental agencies for the planning of local public works projects. This program should be continued with increased appropriations.

In general, private investment is concerned with construction designed to meet relatively short-time needs as compared with major public works. This being the case, much private construction is not as adaptable to a policy of deferment as public works. During a period when the country is prosperous and investment capital is readily available, it will be difficult to persuade individuals or industries that it may be wise to refrain from expanding their facilities. That time may appear to them as opportune for expansion to meet anticipated demands of a seemingly substantial market.

All of these conditions are aggravated by the very nature of the construction industry. Its activity hinges upon innumerable decisions made from day to day, all over the country, by individuals and by communities. Conditions in any given community or region may be considerably out of step with the overall national trend. Restrictive action might be wise in one part of the country at a time when the reverse would be true elsewhere.

These are some of the difficulties.

General Conclusion

Evidence favors adoption of a policy of stabilization through effective timing of public works. This does not mean that public works should be subjected continuously to deliberate manipulation as a means of attempting to control business activity or labor conditions. It is anticipated that private and public construction will continue unhampered and in favorable relation to each other during long periods. Only at times when the approach of critical situations can be recognized should regulation be introduced. In the past, public works have been undertaken on much the same basis as private construction work, namely, on the basis of apparent need, ability to finance, and willingness to undertake the work at a given time. Experience has been that when times are prosperous both private and public works have gone forward in increasing volume, and that when times are dull, they have dwindled together. The objective should be modification of these historic tendencies.

Private enterprise should take the lead in construction, being supplemented by necessary public work. Through intelligent timing of public works, there could be brought about a regulated supplementation of private endeavor with the result of a more uniform flow of construction and substantial stabilization of the construction industry. That would be a constructive accomplishment.

Respectfully submitted,
Public Works Construction Advisory Committee
E. Lawrence Chandler, *Chairman*

New Staff Member on Public Relations

At the Chicago meeting of the Board of Direction in October, President Stevens directed a message to the Board outlining some of his ideas toward progress by the Society. Among the items he covered was that of public relations. On this the President said:

"The engineer is a modest man. He doesn't seek the limelight. His technology fills his soul almost to the exclusion of other things. That is not sufficient; the engineer's place and influence in society deserve consideration. The public needs his services and advice. His powers of analysis make him valuable in social circles where world affairs are considered. He cannot properly push himself into those affairs. He should be invited and he will be invited when people understand him and his accomplishments.

"How can his opinions and his value be brought to the attention of those concerned with such affairs? How can his 'good will' assets be enhanced?

"If that were a technical problem he would know at once how to undertake a satisfactory solution, but it being a human problem he is at a loss how to proceed. Why not attack it in the same way he would attack a technologic problem? If he were a civil engineer and needed the services of an attorney he would employ one. If his work involved architectural technique, he would employ an architect. Then why not employ a public relations technologist to help him solve his human problems?

Allen Wagner

"The medical profession, the American Institute of Architects, the Associated General Contractors, several federal agencies, and surely others, have employed public relations counselors in letting public organizations look behind the scenes in their businesses. Many agencies have a public relations department as a part of their organization. Why not try such a plan for the civil engineer? . . ."

The Board of Direction discussed this matter and directed the Secretary to employ an Assistant whose principal duties would be confined to Society public relations matters.

In response to this direction by the Board, Secretary Carey has appointed Allen Wagner of St. Paul, Minn. Mr. Wagner, for the past four and one-half years Assistant to the Secretary of the Minnesota Mining and Manufacturing Company, where he headed the public relations department, assumed similar duties with the Society on November 15.

Before he became associated with the Minnesota Mining and Manufacturing Company, Mr. Wagner was a newspaper man. He served on the Minneapolis *Daily News* and the Minneapolis *Tribune*, and was city editor of the St. Paul *Daily News*. He also has been editor of the local chamber of commerce house organ and similar publications. He is forty-two years old, married, has one daughter, and lives at 624 Summit Avenue, St. Paul, Minn. He will carry on his work for the Society from its Headquarters in New York.

J.P.H. Perry New President of United Engineering Trustees

At a meeting on October 25, in the Engineering Societies Building, New York, J. P. H. Perry, M. ASCE, vice-president of the Turner Construction Company, New York, was elected president of United Engineering Trustees, Inc. In this office Mr. Perry succeeds F. M. Farmer, vice-president and consulting engineer, Electrical Testing Laboratories, New York.

United Engineering Trustees, Inc., is a corporation set up jointly by the four national engineering Founder Societies, which have an aggregate membership of nearly 75,000. These societies are the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers.

The corporation promotes the advancement of the engineering arts and sciences in all their branches, through two departments, the Engineering Foundation and the Engineering Societies Library. It currently has total assets of nearly three and a half million dollars, not including the value of its library, and is facing a program of expansion to keep pace with increasing demands upon it. The corporation is the titular owner of the Engineering Societies Building and of the trust funds of the Library, the Foundation, the John Fritz Medal Board of Award, and the Daniel Guggenheim Medal Board of Award.

The Engineering Societies Library contains more than 170,000 books and pamphlets, making it one of the largest collections on technical subjects in the world. It receives some 1,700 technical periodicals, from many countries, and maintains complete files of others no longer published. The Foundation was established for "the furtherance of research in science and engineering, and the advancement in any other manner of the profession of engineering and the good of mankind."

Mr. Perry has been closely affiliated with the United Engineering Trustees. He has been a director for the past ten years; was for three years vice-president, and served on the Engineering Foundation Board for three years. Everett S. Lee, engineer-in-charge, General Electric Laboratories, Schenectady, continues as a vice-president. Other officers elected are Ralph M. Roosevelt, mining engineer of New Canaan, Conn., vice-president; Albert Roberts, secretary-treasurer of the Minerals Separation North America Corporation, reelected treasurer; C. R. Jones, eastern transportation manager of Westinghouse Electric Company, reelected assistant treasurer. John H. R. Arms, also secretary of the Engineering Foundation, was reelected secretary of the United Engineering Trustees, Inc.

Army's Use of Term "Architect-Engineer" Curtailed

DURING the war numerous large projects of the Army were designed and supervised by "Architect-Engineer" organizations. Hundreds of engineers—members of ASCE—were engaged in such work, often in charge of the project. A commonly held opinion preferred the separation of the term into its component parts when work primarily in one field or the other was involved. Thus when the layout and design of dwelling units were undertaken, the work should be done by an "Architect," and similarly a sewage plant should be done by an "Engineer."

It was realized that the extent of many projects was so great that the combined efforts of professional specialists were required. Thus the hyphenated term "Architect-Engineer" came to be used widely—so widely indeed that in the interests of his profession, President J. C. Stevens requested that the Army consider giving more attention to the character of the work involved on each project and giving the consultant "Architect" or "Engineer" the dignity of his own professional title. President Stevens' letter is presented here. In replying, the then Acting Chief of Engineers, Maj. Gen. Thomas M. Robins, recognized the interest of the professional groups concerned and assured Mr. Stevens that the use of more specific titles will be introduced wherever appropriate. The reply from General Robins is also here published.

August 17, 1945

Eugene Reybold
Maj.-Gen. U.S.A., Chief of Engineers
3126 New War Department Building
Washington, D.C.

Dear General Reybold:

I believe that I speak the sentiments of virtually all of the more than 20,000 members of the American Society of Civil Engineers when I say that we will greatly appreciate it if your organization will reconsider further use of the title "Architect-Engineer."

We have no quarrel with the architects. They have their field, the engineer has his. Most of the work which the Corps has, and probably will, let out is pure engineering and it somehow hurts an engineer's pride to hyphenize him in this manner.

Is it not possible to do away with that term entirely? If the Corps wishes to make a contract with an engineering firm to do an engineering job, can he not be called simply the Engineer? Similarly contract with an architect to do an architectural job. If an engineering job involves architectural problems, let the contract provide that the Engineer must employ an architect and vice versa.

I feel free to write thus to you because you are a member of the Society. You may recall my meeting you at the convention of the National Reclamation Association in Denver last October.

If a personal visit would be more effective than this letter, I think that Col. Wm. N. Carey, Secretary of the Society, and I would be pleased to go to Washington, D.C., to discuss this question further. Perhaps Gen. Robins, whom I know quite well, would sit in also.

Very truly yours,
J. C. STEVENS, *President*

24 August 1945

Dear Mr. Stevens:

I am in full agreement with the suggestions conveyed in your letter of 17 August 1945 to General Reybold, that the term "Architect-Engineer" be restricted in its use so as not to subordinate the Engineer where his services are of a dominant nature.

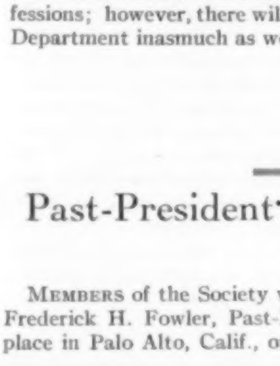
The usage of the term "Architect-Engineer" developed in the course of the prosecution of our extensive military construction program where buildings, dwellings, and similar facilities are provided for the military personnel, and where the architect is engaged jointly with the engineer, who designs roads, airfields, and utilities and provides other engineering services.

Our attentions are now focusing on our Civil functions in which architectural employment is secondary and incidental to engineering. Steps will be taken to introduce for general usage the term "Engineer" where the services are exclusively of an engineering nature. Similarly, the term "Architect" will be used where the services are strictly of an architectural nature, having to do with buildings and dwellings. The term "Architect-Engineer" will continue to be used where the services are representative of both professions; however, there will be a decreasing use of this term in this Department inasmuch as work of this nature is rapidly dwindling.

Sincerely yours,
THOMAS M. ROBINS
Major General
Acting Chief of Engineers

Past-President Frederick H. Fowler Dies

MEMBERS of the Society will be grieved to hear of the death of Frederick H. Fowler, Past-President of the Society, which took place in Palo Alto, Calif., on November 7, following an illness of several months. Mr. Fowler, who was 66, had maintained a consulting practice in San Francisco since 1922. During the war he also acted as consultant to the Corps of Engineers and the Federal Works Agency, having been in Washington, D.C., until about a year ago.



FREDERICK H. FOWLER, 1879–1945

Mr. Fowler was born in an Army Camp—at Fort Custer, Mont.—and educated at Stanford University, receiving the degree of A.B. in 1905. He then became engineer in charge of construction of the California section of Laguna Dam on the Colorado River, near Yuma, Ariz., and in 1906 and 1907 was engineer on surveys for a proposed American River water supply for San Francisco. In 1909 he was engineer on topographic surveys in Michigan, and in 1910 engineer on sewer construction in California. Except for a period of war service as a captain with the 211th Engineers at Camp Meade, Md., Mr. Fowler was for the next twelve years (1910 to 1922) hydroelectric engineer and district engineer for the U.S. Forest Service at San Francisco.

With this background he established, in 1922, a consulting office in San Francisco, which he maintained until his death. Particularly outstanding were his services for the various branches of the government, such as for the Corps of Engineers on dam design for California rivers and for the Federal Emergency Administration of Public Works. He was special consultant to the Public Works Administration on the Fort Peck, Grand Coulee, and Bonneville dams, and had served on the Board of Review of the Atlantic-Gulf Ship Canal. He had also been chairman of the Board of Review of the Passamaquoddy Project and was in charge, as director, of the National Drainage Basin Study covering the entire United States.

Long active in the Society, Mr. Fowler had served on various committees, and in 1939 was president of the San Francisco Section. He served as Director from 1928 to 1930, and as President in 1941. Despite these professional activities, Mr. Fowler found time to write and was the author of articles on power development, dam design, the Colorado River, and other subjects, and in 1923 published *Hydroelectric Power Systems of California*.

Winners of Society Prizes Announced

At the meeting of the Board of Direction held in Chicago in October, decision was reached as to Society prize winners for 1945. A list of the winners and their papers follows.

Merrill Bernard, M. ASCE, the Norman Medal for his paper, "Primary Role of Meteorology in Flood Flow Estimating."

George H. Hickox, M. ASCE, the J. James R. Croes Medal for his paper, "Aeration of Spillways."

Donald N. Becker, M. ASCE, the Thomas Fitch Rowland Prize for his paper, "Development of the Chicago Type Bascule Bridge."

Ole Singstad, M. ASCE, the James Laurie Prize for his paper, "The Queens Midtown Tunnel."

Carl E. Kindsvater, Jun. ASCE, the Collingwood Prize for Juniors, for his paper, "The Hydraulic Jump in Sloping Channels."

All the papers for which these awards were made appeared in Vol. 109 of Transactions. Although the prizes were awarded in 1945, the ceremonies of presentation will not be held until the Annual Meeting in January 1946. There will be biographical sketches and photographs of the winners in the January issue of Civil Engineering.

Intermountain Section Spearheads Utah's Planning Survey

Because of the close correlation between the activities of the Postwar Construction Committee of the ASCE and those of the Committee for Economic Development, it is often very difficult to claim specific credit for Local Section members for a good survey job completed. However, at Salt Lake City there is an organizational setup which justifies giving the Society's Local Section the lion's share of the credit for the splendid job done there by the ASCE-CED organizations.

Much credit for this job is due to two members of the Section's Postwar Construction Committee, R. A. Hart, and his statistical assistant, R. K. Brown. Besides being a Society member, Mr. Hart is State Manager for the Committee for Economic Development, state chairman of the State Veterans Advisory Council, and Industrial Manager of the Salt Lake City Chamber of Commerce. He reports plans for the following private construction:

New buildings and additions	$ 3,773,800
Repairs and remodeling	1,148,200
Plant equipment	4,328,350
Store equipment	112,450
Office equipment	79,050
Hotel and apartment equipment	95,800
Construction equipment	9,000
Automotive equipment	213,800
Other items	4,192,000
	$13,952,450

He also reports a public works program of $70,000,000.

Utah communities have already requested planning funds from the Federal Works Agency to undertake projects totaling $16,-243,835. The advances requested total $490,964. The largest projects contemplated are for Salt Lake City. These include a sewage treatment plant ($2,772,000), storm sewers ($1,050,000), Salt Lake County sanitary sewers ($1,586,700), and Utah state office building ($902,500).

In addition to these actual figures from the survey, Mr. Hart estimates the following potential totals for construction in his area:

Farm improvement construction	$ 46,130,000
Equipment	69,686,000
Total	$115,816,000
Urban householders' construction	$172,000,000
Equipment	186,000,000
Total	$358,000,000

These figures are for the first two postwar years.

A construction dinner meeting was held in Salt Lake City on August 3. There were 53 in attendance, representing all phases of construction and covering an area within a 200-mile radius of Salt Lake City. Robert G. Harding is chairman of the Committee on Postwar Construction, and has as members of his committee, in addition to Messrs. Hart and Brown, Ora Bundy and F. H. Cronholm of Salt Lake City; E. A. Jacob of Provo, Utah; O. C. Lockhart of Ogden, Utah; and E. U. Moser of Logan, Utah.

"Transactions" in February

It has become evident that the 1945 Transactions cannot be issued during this calendar year. But until some fairly definite schedule could be anticipated, specific notice has been withheld. It now appears that February 15, 1946, will be the official mailing date.

While the delay is considerably less than that on the 1944 volume, the situation still reflects wartime conditions and disappointments. Work on these yearly issues starts each spring and, if all goes well, is completed so that the volumes can go in the mails in October. This applies to the paper-bound edition—the cloth and leather bindings are always completed later.

With the paper-bound Transactions planned now for mailing as Part 2 of Proceedings with the regular February number, work on the bindings in cloth and morocco will also be advanced as rapidly as possible. No dates for their completion can be anticipated at this time, and it can only be stated that they will probably be mailed some time in the late winter or spring. Meanwhile work on the 1946 number will be prosecuted in the hope that similar delays will not operate for the following year.

Board Action on Military Training

Action urging establishment of a system of peacetime universal military training was taken by the Board of Direction at its October 15 meeting in Chicago. As directed, the resolution was sent to the President of the United States, the Secretaries of State, War, and Navy, and all members of Congress. The resolution reads as follows:

Universal Military Training Resolution

Whereas the National Defense is a primary duty, and reason for establishment, of the National Government; and

Whereas advances in the technology of modern warfare make possible devastating attacks by aggressors from great distances, unleashed simultaneously with, or in advance of, a declaration of war; and

Whereas the effective use of war machines, their production, maintenance and supply, require a substantial period of individual and organizational training for all types and categories of personnel, which must have been provided in advance of successful resistance to aggression; and

Whereas the National Defense can be adequate in the future only by maintenance in time of peace of very large standing army, navy and air forces or by maintenance of smaller forces together with competently trained civilian reserves; and

Whereas it is contrary to the generally accepted national tradition to maintain in time of peace great military forces, but is clearly consistent with established tradition to share democratically the right and duty of the citizenry to protect the welfare of the nation; and

Whereas contribution by the United States of America to the efforts of the United Nations to maintain a just and lasting peace will be measured by ability promptly to share in effective prevention of aggression and to promote generally accepted ideals of relationships among the nations;

Now Therefore Be It Resolved by the Board of Direction of the American Society of Civil Engineers at its meeting in Chicago, Illinois, on October 15, 1945,

That the establishment by the Congress of the United States of a system of universal military training be urged, to effect adequate National Defense and to promote the security and well being of the nation in time of peace and, if need be, to provide a maximum degree of protection and security in time of war;

That such system be so developed as to integrate civilian and military training for maximum effectiveness of utilization of

talents of all citizens in time of emergency, and to provide a comprehensive listing of citizen reservists to facilitate their proper and most effective use; and

That such system be so devised as to give minimum interference with normal peacetime civilian functions, compatible with the objectives above set forth, and

Be It Further Resolved that copies of this Resolution be sent to the President of the United States, Secretaries of State, War, and Navy, and all Members of Congress, and the Chairmen of such Special Committees of Congress as may be concerned with pertinent legislation.

In the month that has elapsed since mailing of the resolution, numerous replies have been received. Most enthusiastic was the letter from Secretary of War Robert P. Patterson, who stated:

"The action of the Board in support of a system of universal military training is most gratifying to those of us who believe that such training must be an indispensable part of any effective program for national defense.

"The clarity and authority of your thinking concerning the relationship which exists between our advancing technology and trained manpower should exercise a profound influence upon all those who are seeking a realistic solution to the problems of preparedness.

"The interest and support of your organization are greatly appreciated. It is to be hoped that your action combined with that of other representative groups may be determinative in influencing those responsible for providing the United States with military power commensurate with our present international responsibilities and the possible demands of our future security."

Nearly all acknowledgments from Congressmen were of the familiar pattern, "So glad to have your views on this important issue." However, Senator Styles Bridges of New Hampshire added:

"The future security of America must in this troubled time be of paramount importance to every citizen. I believe that each proposal which will help establish lasting peace and help make the future of the country secure should be completely considered and that whatever decisions the times prove necessary should be taken fearlessly.

"We must have a full sense of our responsibility not only of what is good for the country today but through the years ahead."

Senator Joseph H. Ball of Minnesota expressed discouragement at the drift of international relations. His reply explained his position on the issue. He wrote:

"Up to now, I have been inclined to oppose peacetime conscription. Its regimentation and curtailment of individual freedom are repugnant, and I regard scientific research and industrial productive capacity as more vital to defense. But there is no question but that a trained reserve of several million men would be of tremendous value if we are to have another world war in a few years. It is certain, I believe, that in such a war we will not be so fortunate as to have plenty of time in which to train our fighting forces. Our continued existence might well depend on such a reserve, capable of speedy mobilization.

"Our development of the atomic bomb, and the scientific certainty that other great powers will have this terrible weapon within five or ten years at the most, makes it certain that such another war will leave civilization prostrate. There can be no victor except destruction in an atomic war.

"The only alternative I can see that offers any hope whatever of averting this catastrophe is to strengthen and democratize the United Nations Organization to the point where its Security Council could be entrusted with the only legally authorized stockpile of atomic bombs in the world, with the authority and power to immediately disarm any nation which shows signs of preparing to use this weapon aggressively. The United States, which developed and used the bomb, has the responsibility for taking the initiative in developing such an international control. Yet we are making no move whatever in that direction. We are exerting no leadership and the world drifts toward another war. Every poll I have seen shows the American people overwhelmingly opposed to our taking any steps toward sharing the atomic bomb secret, even with a strengthened United Nations Organization. If that is to be our course, then I shall reluctantly support peacetime conscription, which may at least minimize the catastrophe toward which I am certain we are drifting."

Division Prizes Announced

THE J. C. Stevens Award, which was established in 1943, has been presented for the year 1945 to Thomas R. Camp, M. ASCE, for the best discussion of a paper published in TRANSACTIONS in the field of hydraulics. The award, which is given on the recommendation of the Hydraulics Division, goes to Mr. Camp for his discussion of Paper No. 2218, entitled "Effect of Turbulence on Sedimentation," in the 1944 TRANSACTIONS.

For the biennium now ending, the Karl Emil Hilgard Prize in Hydraulics is being awarded, on the recommendation of the Hydraulics Division, to L. Standish Hall, M. ASCE, for Paper No. 2205 in the 1943 TRANSACTIONS, entitled "Open Channel Flow at High Velocities."

On the recommendation of the Sanitary Engineering Division, the Rudolph Hering Medal goes to Langdon Pearse, M. ASCE, in his capacity as chairman of the Committee of the Sanitary Engineering Division on Sewerage and Sewage Treatment that prepared the Second Progress Report, appearing in the April 1944 PROCEEDINGS.

Award of these prizes has been confirmed by the Board of Direction.

Advisory Committee on Construction Urges Continuation of C.E.D. Development Activities

ON MONDAY, November 19, 1945, Chairman Malcolm Pirnie, M. ASCE, called a meeting of his Action and Advisory Committee on Construction for the purpose of formulating plans for its continued activities. This committee is composed of the members of the ASCE National Committee on Postwar Construction plus the following representatives of other societies: Arthur C. Holden, of the American Institute of Architects; E. A. Prentis, Jr., of the American Institute of Mining and Metallurgical Engineers; Robert S. Hackett, of the American Society of Mechanical Engineers; Gano Dunn, of the American Institute of Electrical Engineers; and C. R. Downs, of the American Institute of Chemical Engineers.

In view of the fact that the Postwar Construction Committee of the ASCE has been dissolved, this Action and Advisory Committee is the Society's channel of cooperation with the activities of the Committee for Economic Development.

At the November 19 meeting of the Action and Advisory Committee, the following resolution was passed unanimously by those present:

"During the war, the Committee for Economic Development carried on field activities to encourage private business leaders to plan in their local communities for a high level of postwar employment and economic activity. One phase of this field activity involved the work of the Action and Advisory Committee on Construction.

"The abrupt end of the war and return to peace has accentuated the need for these field activities. Such activities are essential to continued public understanding and local action on major policies resulting from research programs of the Committee for Economic Development.

"In private and public construction to supply the collective needs of community growth, it is important that engineers and architects continue to join with other community leaders to promote necessary local construction programs. These and other private planning and promotional activities must be continued on an organized basis if the American free enterprise system is to be maintained and strengthened, and the goal of high production and employment is to be achieved.

"*Therefore be it resolved* by the Action and Advisory Committee on Construction to the Committee for Economic Development, that the Committee for Economic Development should continue its general field development activities, including the construction program, until such time as an alternative adequate organized method of promoting these activities is established on a firm basis in the United States."

Quarterly Meetings of ASCE Scheduled for 1946

With the lifting of travel and convention restrictions, the Board of Direction, at its Chicago meeting, voted to resume the full schedule of regional meetings of the Society in the coming year. The Ninety-Third Annual Meeting of the Society will be held in New York in January. For the full announcement of this meeting see the item elsewhere in this section.

For the Spring Meeting, Philadelphia has been chosen. This session will be held late in April. In July will come the Annual Convention, to be held in Spokane, Wash. Later in the year the Fall Meeting will convene in Kansas City. Full announcements of these later meetings will be presented when arrangements for them have progressed further.

Construction Prize to C. Glenn Cappel

This year's recipient of the Construction Engineering Prize—given annually on advice of the Construction Division for the best original scientific or educational article on construction published in Civil Engineering—is C. Glenn Cappel, M. ASCE. Mr. Cappel receives the award for his paper, entitled "Timber Hangar Erected from 16-Story Scaffold," which appeared in the December 1944 number.

The prize is being given for the seventh time, having been established in 1939 through the generosity of A. P. Greensfelder, M. ASCE. It is the only prize specifically limited to material appearing in Civil Engineering. Mr. Cappel will receive the award at the time of the Annual Meeting in January.

E.C.P.D. Elects Officers

At the 1945 Annual Meeting of the Engineers' Council for Professional Development, which was held in the Engineering Societies Building, New York, N.Y., on October 19 and 20, Everett S. Lee, engineer of the General Engineering and Consulting Laboratory, General Electric Company, Schenectady, N.Y., was reelected chairman and James W. Parker, president, general manager, and director, The Detroit Edison Company, Detroit, Mich., was reelected vice-chairman. Wm. N. Carey, Secretary and Executive Officer of the ASCE, and H. H. Henline, National Secretary, A.I.E.E., were elected secretary and assistant secretary, respectively.

For chairmen of E.C.P.D. committees, the following elections were announced: Committee on Student Selection and Guidance, Carl J. Eckhardt, Jr., professor of mechanical engineering and superintendent of utilities, University of Texas; Committee on Engineering Schools, D. B. Prentice, president, Rose Polytechnic Institute; Committee on Professional Training, C. A. Pohl, consulting engineer, New York; Committee on Professional Recognition, N. W. Dougherty, dean of engineering, University of Tennessee.

Representatives to E.C.P.D. appointed by the constituent bodies were announced as follows: Scott Lilly, ASCE; A. F. Greaves-Walker (reappointment), A.I.M.E.; John E. Younger, A.S.M.E.; M. S. Coover, A.I.E.E.; D. B. Prentice (reappointment), S.P.E.E.; deGaspé Beaubien, E.I.C.; and George M. Shephard, N.C.S.B.E.E.

Serving on the Executive Committee of E.C.P.D. for the coming year will be: R. E. Bakenhus, ASCE; W. B. Plank, A.I.M.E.; R. L. Goetzenberger, A.S.M.E.; M. S. Coover, A.I.E.E.; S. D. Kirkpatrick, A.I.Ch.E.; H. S. Rogers, S.P.E.E.; C. R. Young, E.I.C.; and C. C. Knipmeyer, N.C.S.B.E.E., as well as the chairman, vice-chairman, secretary, and assistant secretary.

At the annual banquet on Friday evening, October 19, E. S. Lee presided and the general subject of discussion was "E.C.P.D. and the Engineering Profession." Mr. Lee read his annual report. A. R. Cullimore, retiring chairman of the Committee on Student Selection and Guidance, spoke with feeling on "The Veteran Returns," and R. L. Sackett, retiring secretary, delivered an address on "The Future of E.C.P.D."

Engineers' Council for Professional Development is a conference of engineering organizations, formed to enhance the professional status of engineers through cooperative effort. Its constituent organizations are: American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Institute of Chemical Engineers, the Engineering Institute of Canada, the Society for the Promotion of Engineering Education, and the National Council of State Boards of Engineering Examiners.

Construction Advisory Council Meets in Washington, D.C.

The first meeting of the newly formed Construction Industry Advisory Council was held in Washington, D.C., on November 1, 1945. Representatives of 95 professional and trade organizations assembled to discuss various problems facing the industry. Serving as chairman, Society President J. C. Stevens led the conference through a thorough examination of the needs of a non-inflationary reconversion to peacetime activity.

The purpose and scope of the activities of the Council were outlined by Earl O. Shreve, vice-president of the General Electric Company. Three points stressed were: (1) to help develop construction industry opinion; (2) to make recommendations to the Construction and Civic Development Department Committee of the Chamber of Commerce for carrying out policies or programs of common interest to the construction industry; and (3) to provide the Department Committee with more clearly defined and better organized contacts with professional and trade associations in the construction field than now exist.

Later, under authority granted him by the Council, Chairman Stevens announced the appointment of a liaison committee with the government to stimulate construction. The men who have agreed to serve on this committee are: James Edmunds, president, American Institute of Architects, Baltimore, chairman; Harry A. Dick, president, Associated General Contractors of America, Portland, Ore.; Richard J. Gray, acting chairman of executive council, Building and Construction Trades Department, A. F. of L., Washington, D.C.; Norman P. Mason, vice-president, National Retail Lumber Dealers Association, North Chelmsford, Mass.; Robert W. McChesney, president, National Electrical Contractors' Association, Washington, D.C.; Joseph E. Merrion, president, National Association of Home Builders, Chicago; Allen J. Saville, M. ASCE, president, Allen J. Saville, Inc., Richmond, Va.; Charles Warner, president, Warner Company, Philadelphia, Pa.; and Douglas Whitlock, chairman, advisory committee, The Producers' Council, Washington, D.C.

Engineering Foundation Chooses Officers for Coming Year

At its annual meeting on October 18, the Engineering Foundation elected Dr. A. B. Kinzel, internationally known metallurgist, as chairman for the coming year. Other officers elected were Dr. L. W. Chubb, director of the research laboratories of Westinghouse Electric Company, as vice-chairman; Dr. Edwin H. Colpitts, formerly director of the Bell Telephone Laboratories, reelected director; and John H. R. Arms, reelected secretary. Dr. Kinzel will represent the Engineering Foundation on the Executive Board of the National Research Council.

During the year just ended, the Foundation has participated in eleven researches, all associated with some phase of war work, and covering the various fields of engineering. The subjects included soil mechanics and foundations, critical pressure of steam boilers, plastic flow of metals, and cooperation with the Welding Research Council, the Engineers' Council for Professional Development, and the National Academy of Sciences.

The Engineering Foundation was established in 1913 for "the furtherance of research in science and engineering and for the advancement in any other manner of the profession of engineering and the good of mankind."

Recognition of Student Chapter Accomplishments in 1944

YEARLY, since 1935, the Committee on Student Chapters has recommended for the approval of the Board of Direction of the Society, the Student Chapters to receive the President's letter of commendation for their record of outstanding activities and accomplishments. The letter of commendation for the period covering January 1 to December 31, 1944, has been sent to the following Chapters:

Location of Chapter	Date of Establishment	Number of Times Commended
George Washington University	1922	1st time
Swarthmore College	1921	1st time
University of Tennessee	1923	1st time
Case School of Applied Science	1925	2nd time
University of Colorado	1920	2nd time
Manhattan College	1924	2nd time
University of Minnesota	1921	2nd time
University of Kansas	1921	3rd time
Northeastern University	1939	3rd time
University of California	1921	4th time
Iowa State College	1920	5th time
New York University	1921	5th time
Pennsylvania State College	1920	5th time
Stanford University	1920	7th time
Virginia Military Institute	1921	9th time

News of Local Sections

Scheduled Meetings

ALABAMA SECTION—Annual meeting at the Thomas Jefferson Hotel, Birmingham, on December 7 and 8.

CENTRAL ILLINOIS SECTION—Dinner meeting on December 4, at 6 p.m.

CINCINNATI SECTION—Meeting in the Engineering Societies Building on December 4, at 8 p.m.

COLORADO SECTION—Dinner meeting at the Oxford Hotel on December 10, at 6:30 p.m.

DAYTON SECTION—Luncheon meeting at the Engineers' Club on December 17, at 12:15 p.m.

FLORIDA SECTION—Dinner meeting at the Seminole Hotel on December 7, at 7 p.m.

ILLINOIS SECTION—Luncheon meeting at the Palmer House, Chicago, on December 14, at 12:15 p.m.

INDIANA SECTION—Meeting at the Claypool Hotel on November 30–December 1, at 9 a.m.

KENTUCKY SECTION—Inspection trip and dinner meeting on December 14—trip at 3 p.m. and dinner at the Kentucky Hotel at 6:30 p.m.

LOS ANGELES SECTION—All-day meeting at the University Club on December 12.

MARYLAND SECTION—Dinner meeting at the Engineers' Club on December 12—Cocktails at 6 p.m., dinner at 7 p.m., and meeting at 8 p.m.

METROPOLITAN SECTION—Technical meeting in the Engineering Societies Building on December 19, at 8 p.m.

MIAMI SECTION—Dinner meeting at the El Commodoro Hotel on December 6, at 7 p.m.

MID-SOUTH SECTION—Annual meeting at the Albert Pike Hotel in Little Rock on December 10, at 9 a.m.

NORTHWESTERN SECTION—Dinner meeting at the Minnesota Union on December 3, at 6:30 p.m.

OKLAHOMA SECTION—Dinner meeting in the Y.W.C.A. Colonial Room, Oklahoma City, on December 8, at 3:30 p.m.

PHILADELPHIA SECTION—Technical meeting at the Engineers' Club on December 11, at 7:30 p.m. (Dinner at 6 p.m.)

ST. LOUIS SECTION—Annual dinner at the Coronado Hotel on December 7, at 6:30 p.m.

SAN DIEGO SECTION—Dinner meeting at the U.S. Grant Hotel on December 20, at 6:30 p.m.

SAN FRANCISCO SECTION—Dinner meeting at the Engineers' Club on December 18, at 5:30 p.m.

TENNESSEE VALLEY SECTION—Christmas party of the Knoxville-Sub-Section at the S. & W. Cafeteria (date to be announced later) at 6 p.m.

TEXAS SECTION—Luncheon meeting of the Dallas Branch at the Adolphus Hotel on January 7, 1946, at 12:15 p.m.

TRI-CITY—Dinner meeting at the Blackhawk Hotel, Davenport, Iowa, on December 13, at 6:30 p.m.

Recent Activities

BUFFALO SECTION

On October 17 members of the Buffalo post of the Society of American Military Engineers were guests of the Section for their regular monthly luncheon meeting. The speaker for the occasion was Col. E. H. Coe, commanding officer of the 341st Engineer General Service Regiment, who discussed the work of his regiment in rebuilding bridges in the European theater of war. Altogether he reconstructed 110 bridges, with an aggregate total length of over 12,000 ft. Sixty-seven of them were in Germany, and 64 of them were built in the last 75 days of the war.

CENTRAL OHIO SECTION

The principal speaker at the September 20 meeting of the Central Ohio Section was George W. White, professor of geology at Ohio State University. Discussing the subject, "Ohio's Position in the Mineral Industry," Professor White presented some interesting facts on the industrial minerals produced in the state and pointed out their use and importance in our national economy.

CLEVELAND SECTION

A talk on "Bonding Experience on Engineering Contracts" comprised the technical program at the October 19 dinner meeting of the Cleveland Section. This was given by Charles S. Clark, who explained the organization and functioning of bonding companies. During the business session Society Director Frank C. Tolles gave a brief report on the Chicago meeting of the Board of Direction.

FLORIDA SECTION

The subject of discussion at the October meeting of the Florida Section was the zoning of Duval County. Those taking part were R. H. Croasdell, zoning engineer, and Arthur A. Sollee, county engineer. There was a large attendance at the November meeting, at which B. J. Fletcher, chief engineer on structural aluminum, Development Division of the Aluminum Company of America, was the principal speaker. Mr. Fletcher's talk covered the use of aluminum for airplanes, castings, forges, thin sheets, bridges, and deckhouses on Navy vessels. He pointed out that the use of structural aluminum resulted in considerable savings in dead weight, thereby providing a saving in secondary materials and allowing a larger live load. Moving pictures of the fabrication of a 100-ft aluminum plate-girder bridge concluded the program.

INTERMOUNTAIN SECTION

A symposium on sanitary engineering had been arranged for the September 14 meeting of the Section. The first speaker appearing on the program was Howard Hurst, state sanitary engineer for Utah, who discussed the subject of water works and sewage plants in the state. Mr. Hurst stated that sewage-disposal facilities in Utah are from 25 to 30 years behind the times and that projects costing eleven million dollars would be required to complete the installations now needed. He was followed by two members of the Ninth Service Command—Lt. Col. R. N. Clark, chief of the Sanitation Section of the Preventative Medicine Branch, and Capt. N. W. Nester, officer in charge of refuse disposal. Both commented on various phases of the subject, pointing out that Corps of Engineer installations are in accordance with state laws and therefore vary greatly throughout the country. A talk by Secretary Carey on the aims and activities of the Society concluded the program. The principal speaker at the October meeting was Ralph Sheffield, who developed the subject, "Planning for a Greater Salt Lake City."

Illinois Section

A joint luncheon meeting of the Illinois Section and the Chicago Engineers Club took place on October 23. A very interesting talk, entitled "Atomic Energy, Nuclear Physics, and Modern Alchemy," was given by Dr. L. E. Grinter, dean of the College of Engineering at the Illinois Institute of Technology. Dr. Grinter substituted on short notice for the scheduled speaker, Dr. James S. Thompson, chairman of the department of physics at the Institute, who was detained by illness. There was a special dinner meeting on the 15th in honor of the Board of Direction and the Society officers. Both President Stevens and Secretary Carey spoke briefly. A strolling accordionist and a string trio provided music during dinner, and later in the evening a sleight-of-hand artist gave a performance.

Indiana Section

The topic of engineering education was considered at the October 26 meeting of the Section, the principal speaker being D. B. Prentice, president of Rose Polytechnic Institute. In his talk Dr. Prentice emphasized the teaching of non-technical subjects to engineering students, stating that it is the aim of the Institute to meet the aim of educators that 25% of the curriculum be made up of such subjects. He recommended that the non-technical subjects be distributed over the entire college course, with emphasis on teaching the students to write and speak correctly.

Kansas City Section

At the October 18 dinner meeting Secretary Carey spoke on Society affairs and, later, led a general discussion on the subject. The technical program for the occasion consisted of talks by Thomas J. Seburn, traffic engineer for Kansas City, whose subject was the city's street-lighting program, and K. K. King, director of public works for Kansas City, who gave a brief report on the city's public works program.

Kentucky Section

The September 28 meeting of the Section took the form of a joint session with the Junior Forum. President Sanders turned the meeting over to Homer Willis, acting chairman of the Junior Forum, who introduced the speakers of the evening—Marion C. Welch, Howard T. Ward, and Joseph D. Cochran. All are V-12 Navy men, who have seen extensive action and who described their experiences, engineering and otherwise, with the fleet. During the evening a resolution in memory of the late George T. Seabury, Secretary of the Society, was adopted.

Lehigh Valley Section

The first technical meeting of the fall season was held at Lehigh University on October 8. A lecture on "Airfield Construction Activities in the European Theater" comprised the technical program. This was presented by Col. F. F. Frech, district engineer for the U.S. Engineer District at Philadelphia, who described many of his experiences in the European theater from December 1943 to the German surrender. During the period in question Colonel Frech served as Air Force Engineer for Supreme Headquarters, Allied Expeditionary Forces.

Mid-Missouri Section

Members of the Mid-Missouri Section enjoyed two meetings in October. On the 16th there was a gathering aboard the chartered excursion boat, "Governor McClurg," which cruised on the Lake of the Ozarks during the dinner and meeting. The principal speaker was Lt. Col. E. M. Fry, of the Combat Engineers of the 8th Army, who discussed the operations, methods, and equipment used in crossing rivers under combat conditions. The other meeting was held at the Missouri School of Mines at Rolla on the 24th. The speaker for the occasion was Oscar L. King, director of the Society's Postwar Construction Committee, who outlined the aims of the committee and discussed the role of the construction industry in the postwar period. In the question-and-answer session that followed, discussion ranged from prefabricated housing to the problem of securing engineering personnel to prepare plans.

Nebraska Section

A new era of development in the Missouri River Basin was forecast by Lt. Col. Delbert B. Freeman before the September meeting of the Nebraska Section. Colonel Freeman, who is district engineer for the U.S. Engineer Office at Omaha, described the organization and workings of the Missouri Basin Inter-Agency Committee with state representation, under which planning studies are being made. He explained the physical features of the plan, including 5 main-stem reservoirs, 100 tributary reservoirs, and extensive levee systems. The project is being sponsored jointly by the Corps of Engineers and the U.S. Bureau of Reclamation, and Colonel Freeman declared that it will "provide the means for an expanding economy in the vast Missouri area."

Oregon Section

At the dinner meeting held on October 6 Julian Hinds gave an illustrated talk on the Los Angeles water supply, pointing out the interesting engineering problems confronting him and his staff in planning an adequate and economical water supply for the city. Mr. Hinds is general manager and chief engineer of the Metropolitan Water District of Southern California. Numerous committee reports were read at the November meeting—held in Portland on the 2nd. Then H. J. Andrews, regional forester for the U. S. Forest Service, addressed the group on the subject, "Planning Ahead in Forestry, and the Forest Industry in the Pacific Northwest." His talk was followed by a sound motion picture illustrating the Forest Service's position on the use of forest lands for the benefit of the country as a whole. The film was presented by George Griffith.

St. Louis Section

"The Importance of Railroads" was discussed by A. A. Miller at the September 24 meeting of the St. Louis Section. Mr. Miller is chief engineer of Maintenance of Way and Structures for the Missouri Pacific Railroad and current president of the American Railway Engineering Association. At the October luncheon meeting three reels of motion pictures, depicting the amazing engineering accomplishments in connection with the construction of artificial harbors for the invasion of Normandy, were shown. Much of the session was devoted to business discussion.

San Diego Section

Speakers at the September meeting of the San Diego Section were H. L. Thackwell, Western representative of the Society, and Professor Baird, of the physics department at San Diego State College. Mr. Thackwell spoke on the subject, "Functions of a Field Secretary," while Professor Baird discussed the technical development of the atomic bomb.

San Francisco Section

An interesting technical program had been arranged for the October 16 dinner meeting of the San Francisco Section. This consisted of talks by C. G. Gillespie and E. A. Reinke, respectively, chief and senior sanitary engineer for the California State Bureau of Sanitary Engineering, who presented the subject, "Postwar Sanitation Projects in Northern California"; Sherman P. Duckel, of the San Francisco City Engineer's Office, who described the city's sewage disposal projects; and George L. Sullivan, dean of the college of engineering at the University of Santa Clara, whose topic was "Purpose and Scope of the Santa Clara County Postwar Sewage Disposal Study."

Seattle Section

A symposium on the work of the U.S. Navy and Coast Guard in the winning of the war was presented by a group of Naval officers at the October 29 meeting of the Section. Participants were Comdr. R. E. Slattery, of the Civil Engineer Corps of the U.S. Naval Reserve, who described the construction of the Naval air base at Sitka; Comdr. P. F. Keim, also of the Civil Engineer Corps of the U.S. Naval Reserve, who related his experiences in the construction of installations at Midway Island; Capt. G. A. Duncan, Civil Engineer Corps, U.S. Navy, who discussed his experiences in England and showed a color film of British flame experiments; and Capt. E. B. Keating, Civil Engineer Corps, U.S. Navy, who gave an illustrated description of the construction of graving docks by the tremie method at the Brooklyn Navy Yard. A U.S. Coast Guard film, depicting part of the Normandy invasion, was also shown by Chief Petty Officer, J. W. Smith.

Syracuse Section

The Syracuse Section met for a business session on October 22. At the conclusion of discussion, the group adjourned to meet with

the Technology Club of Syracuse. The joint gathering then heard Thomas Gill speak on the dewatering of excavations.

Tacoma Section

At the first meeting of the fall season—held at an inn midway between Tacoma and Olympia on September 18—President Finke brought the group up to date with a report on the activities of the Section and officers during the summer recess. The technical program for the occasion consisted of a talk on the Alaskan air bases, by Elmer C. Carlson, of the Seattle district of the U.S. Engineer Office, who was in charge of the construction of the bases. Colored motion pictures of the construction work supplemented his talk and well illustrated the handicaps of climate and terrain that had to be overcome in building the airfields. The principal speaker at the October meeting was A. F. Darland, who talked on the Grand Coulee Dam and irrigation development. Until recently Mr. Darland was construction engineer for the U.S. Bureau of Reclamation on the project.

Texas Section

The fall meeting of the Texas Section was held at Galveston on October 19 and 20, with the usual get-together at the Galvez Hotel, meeting headquarters, on Thursday evening, the 18th. Those who had arranged to come on Thursday had an opportunity to renew old friendships, and to enjoy a program of interesting moving pictures. The Friday morning session was called to order by President Grayson Gill, and the group was welcomed by George W. Fraser, mayor of Galveston. Scheduled speakers on the morning technical program were Col. D. W. Griffiths, district engineer for the U.S. Engineer Office at Galveston, who discussed postwar planning and the construction program of the Galveston District, and J. Neils Thompson, who presented a paper on the "Design and Foundation of the Dam on the San Jacinto River." Mr. Thompson is on the engineering staff of the University of Texas. Following a luncheon that noon, Lt. Col. H. R. Norman, of the U.S. Engineer Department, presented a paper on the "Development of the Plans for Whitney Dam." During the business session that followed it was announced that a certificate of life membership in the Society had recently been presented to J. Z. George, of Dallas. The annual election of officers, also held at this time, resulted as follows: H. R. F. Helland, president; T. C. Forrest, Jr., and Uel Stephens, vice-presidents; and John A. Focht, secretary-treasurer. In taking the chair, Mr. Helland said that he was honored by being the first son to follow in his father's footsteps, the latter having been president of the Section in 1920. A dinner dance concluded the day's activities. Saturday morning several boats transported the members up the ship canal to the San Jacinto Inn, where luncheon was served. Though the luncheon officially concluded the meeting, many of the group returned to Galveston in the afternoon to inspect several submarines, which were tied up at the wharf and open to the public.

Toledo Section

On October 3 members of the Toledo Section heard Walter V. Burg speak on the timely topic of "Atomic Energy." Mr. Burg's talk elicited an enthusiastic general discussion. He is associate professor of chemistry and metallurgy at the University of Toledo. On the 24th members of the Section participated in the fall meeting of the Toledo Technical Council, of which the Section is a participating group. A symposium on magnesium alloys was the feature of the latter occasion, the speakers being Charles H. Kuthe, Ted Caldwell, and Dan W. Moll.

Tri-City Section

There was a good attendance at the October meeting of the Tri-City Section, which was held at Muscatine, Iowa, on the 17th. The program for the occasion had been arranged by C. M. Stanley and the members of his firm, the Stanley Engineering Company of Muscatine. First, the group was conducted through the Muscatine municipal power plant, which was designed by the Stanley firm. Following the inspection of the plant and a dinner, the members of the firm presented a symposium on "Civil Engineering in Steam Power Plants." Mr. Stanley discussed the general problems; M. O. Kruse, the hydraulic problems; H. S. Smith, the architectural and structural problems; and G. M. Shook, the construction problems. The guest of honor was Secretary Carey, who discussed Society affairs with the group. The topics of discussion included the development of public relations and the possibility of allowing Juniors a voice in the government of the Society.

Student Chapter Annual Reports

Abstracts of Reports as Provided by the Society's Committee on Student Chapters, Covering Roughly the Year 1944. Other Abstracts Appeared in the November Issue

The Chapter at Case School on Inspection Trip to Ravenna Ordnance Plant

Case School of Applied Science

The Chapter was particularly fortunate in that the Navy, in its V-12 Training Program, had assigned 26 of its men selected for training in civil engineering to the unit at Case. Without this influx, the membership of the Chapter would have been limited to the previous total enrolment in the department, which was only 14—a number so small that effective action would have been difficult to organize. One of the high lights of the 1944 school year was a field trip on August 30 to the Ravenna Ordnance Plant. The afternoon was devoted to talks by representatives of the War Department and of Wilbur Watson and Associates, architect-engineers on this 60-million-dollar loading plant. The talk given by S. W. Symns, resident engineer on new work under way, covered the initial surveys and the building of the 100 miles of railroad, 50 miles of highway, and 3,000 structures needed for the project. George E. Barnes, Faculty Adviser for the Chapter, who was consulting engineer on all water supply and sewerage on the project, described those features. Then inspection of the project followed.

George Washington University

An annual report, bound, indexed, and reflecting real "personality," was rendered by this Chapter. Eight meetings were held during the year in spite of the fact that the majority of the members are full-time government employees attending school at night and with little time for extracurricular activities. Shortage of gasoline and the confidential nature of the work being done by the near-by industries curtailed the usual inspection trips. The university maintains an Engineers' Council as a coordinating body for all student engineering activities. This is composed of two mem-

bers from each Student Chapter and from each of the engineering fraternities. The council sponsors an annual engineers' ball and a banquet, and publishes a monthly paper, the *Mechelecív*, with a column for each chapter and each engineering fraternity. It was felt that the program presented during the year did much to encourage professional engineering interest and thinking among the Chapter members.

Iowa State College

The Iowa State College Student Chapter held its customary annual roundup at Brookside Park on May 10. "We like this Iowa State custom, as the picnic gets everyone better acquainted. The attendance was about a hundred. A feature was the student-faculty softball game. Anyone would believe the faculty to be at a disadvantage in a ball game, but here is where it showed its ingenuity. Report has it that the 'Profs' promised to flunk every Navy civil, if they were permitted to fill the bases. So rather than go to Great Lakes, the boys let them have their way. By dint of half a dozen errors, the boys let the Faculty Adviser in for a home run. When it came time to count score, the boys claimed his run on the ground that their teamwork in errors had made it possible!

"From the other details of the picnic, it appears that all present enjoyed themselves, and we wouldn't be surprised to see ex-Navy men going back to finish their educations where this live Chapter is located."

Manhattan College

When the new officers took over the conduct of Chapter affairs in January 1944, it became evident that concerted effort and enthusiasm would have to make up for the deficiency in numbers. At the first meeting it became necessary to consider a change in membership qualifications, as the accelerated program made the usual classification of students impossible. Thus it was decided to allow membership in the Chapter to any student registered in civil engineering who had completed 20 credits.

Following a Meeting of Manhattan College Chapter
Reading Left to Right: Frank Valenziano, Francis Sheridan, Joseph M. Kennedy (Speaker), Brother Joseph, and Thomas Glyn

There followed an active year with a high attendance at the 13 business and technical meetings. The annual outing in May, held at Schmidt's Farm in Yonkers, was enjoyed by nearly every member, and the annual engineers' dance was sold out before the doors opened. Special interest was shown in the September meeting, at which the topic of discussion was "Engineer for the New York County's District Attorney's Office." All were curious to learn what an engineer might be doing in the official family of a District Attorney. The speaker proceeded to show the importance attached by the office to the assembly and presentation of technical evidence by its engineer in a great many cases that the District Attorney must prosecute. So far as is known, New York County is the only one with a civil engineer on its permanent staff.

College of the City of New York

Because of the untiring efforts of an ambitious executive board, the Chapter has overcome the handicaps inflicted by the war, and this year has been one of the most productive and active in its 21-year history. The program for the year consisted of 6 business and 6 technical meetings, together with 2 field trips, all of which were well attended. Most of the business sessions were devoted to a comprehensive revision of the Chapter constitution, finally completed in October. Socially speaking, also, the Chapter has had a successful year, and we were extremely gratified by the large percentage of civil engineering instructors who attended our functions. In the field of sports, we produced an invulnerable baseball team that triumphed over all opponents.

In October the following resolution was adopted: "An award of a civil engineering handbook shall be made each semester to a deserving student paper on civil engineering as selected by the Faculty Adviser." The three competing papers were published in the School of Technology magazine, "Vector."

New York University

During the calendar year of 1944, this Chapter carried out a program of 18 meetings—10 held by the day and 8 by the evening group. Several of these were conducted as joint sessions of the two groups or with student members of other professional societies. The officers are proud of the spirit of loyalty and cooperation displayed by Chapter members, as evidenced by the nearly 100% attendance at its functions.

Beginning in September 1944, the Chapter found itself without officers, because of the graduation of seniors, and a nucleus of only 14 civil engineering students with which to conduct its activities. Nevertheless, it was decided to carry on, and at an early October meeting new officers were selected and a program for the year was arranged.

In addition to business sessions, field trips, and technical programs, the Chapter, through elected editors, published an 11-page issue of *On the Level*. This issue included college news items, news of classmates, and an interesting article on "The Engineer Officer Candidate School," together with a variety of sports and general news items.

North Carolina State College

The Student Chapter at North Carolina State College was active in 1944, though its activities were limited by constantly changing officers and personnel and by the reduced number of those eligible for membership. All meetings were given over to Chapter business, except on one occasion when a movie on water distribution systems was shown by the president.

Northeastern University

Accelerated programs have "heavied up" academic schedules and kept the student occupied in lecture halls or laboratories until 5 o'clock nearly every day. This, together with limited transportation facilities and the pressure placed upon practicing engineers by the war, has made it difficult to carry on the usual number and variety of professional activities. In the early part of the year we turned to our constitution for guidance and incentive and noted that "This Society is founded in order to foster friendship and cooperation among the civil engineering students, to introduce them to organizational procedures, and to promote an active interest in professional activities through the medium of meetings and field trips."

It is the feeling of the executive committee that we have fulfilled our purpose and that our year's program has been a definite and valuable asset to our civil engineering students. There were 13

Members of the Northeastern University Student Chapter

meetings with outside speakers and one field trip—to Logan Airport in east Boston. Perhaps the highlight of the year's activities was the Annual Student Night, sponsored by the Northeastern Section of the Society and the Boston Society of Civil Engineers at Northeastern University in October.

Swarthmore College

The first meeting of the Swarthmore College Student Chapter for the summer term of 1944 was devoted to a discussion of plans for a general engineering club. A motion was passed authorizing the officers of the American Society of Civil Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers chapters to serve as a committee to organize a general engineering club. The remainder of the meeting was devoted to a motion picture showing the construction of the San Francisco Golden Gate Bridge. About 30 members of the A.I.E.E. and A.S.M.E. groups on the campus saw the film as guests of the Chapter.

University of Kentucky

The University of Kentucky Chapter held eight meetings in 1944, all of which were attended by the Faculty Adviser. As in all other American colleges and universities, membership and activities were curtailed by the demands of the war. An interesting trend was the fact that a group of young women became members, and one of them was elected secretary for 1945. Five of the papers delivered were prepared by student speakers. Competition was held for the best student papers and speakers with a student group from the Student Chapter of the University of Louisville.

University of Maryland

The meetings from January until June were regular separate meetings of the Chapter. With the summer quarter the enrolment of the College of Engineering had so decreased in all branches that the student chapters in chemical, civil, electrical, and mechanical engineering found it expedient to hold joint meetings. Thus all the chapters met on the same night and held short business meetings, after which all adjourned to a main lecture hall where the program of the evening was presented. Four of these joint meetings were held during the quarter, with each engineering society responsible for one. The topics chosen were necessarily of a general engineering nature. It is probable that the plan will be continued this year and until enrolment increases to a point where independent meetings are feasible.

University of Minnesota

Typical of the general situation, the turnover at the University of Minnesota was high. Civilian students were withdrawn rapidly, and Naval regulations limited the days on which meetings could be held. Thus many of the social affairs had to be abandoned, although the annual picnic was held as successfully as usual. The accelerated program in effect at the university might have been expected to cut the number of meetings. On the contrary, in keeping with the generally faster tempo, eleven meetings were held instead of the usual eight, and reports indicate that they were of the usual high standard of the University of Minnesota Chapter.

Other typical difficulties overcome were a low treasury due to small college enrolment and changes of personnel resulting in two completely different administrations. Of help were active membership drives, which were originated each quarter.

University of Nebraska

A sidelight on the impact of the war on educational institutions is shown at the University of Nebraska, where only six students were eligible to membership in the Society. All six became members. The Chapter held seven meetings during the year, with 100% attendance of Chapter members and a number of visitors from other engineering groups. Novel to the Chapter was the March 8 meeting, at which three sophomores presented a seminar on collective bargaining for engineers.

University of Oklahoma

Personnel of the University of Oklahoma Chapter was largely made up of Navy trainees, with a resulting rapid turn-over in membership. Seven meetings were held during the year, and effective use was made of local engineers as speakers. The Chapter staged an exhibit at the university's annual Engineers' Open House, which won top prize. As a social event, a watermelon feast, sponsored by the Chapter, was a real success. The Faculty Adviser notes that the Chapter has served admirably in bringing together its members in a spirit of unity of purpose.

University of Pennsylvania

Since the beginning of the present academic term the energies of our Faculty Adviser, Prof. W. H. Chorlton, have led to a vast increase in the Chapter's activities, and it can honestly be said that it is now functioning on a near-normal level. In the spring of the year, an inspection trip to the Warner Concrete Company was enjoyed. Because of the exceptionally small enrolment in each of the four student chapters on the campus, it was suggested that joint meetings of the groups be held bi-monthly, with each chapter acting as sponsor at one meeting. This would ensure an audience sufficient to warrant the engagement of a speaker. The plan was accepted by all the groups.

University of Tennessee

The 1944 annual report of the Chapter was attractively prepared and well expressed the personality of the small but enthusiastic group that made up its membership. A successful innovation was the holding of joint meetings with the Junior members of the Knoxville Sub-Section of the Tennessee Valley Section. Student members of this Chapter frequently attend the meetings of the Tennessee Valley Section. At the 9 meetings that were held a wide range of subjects was covered, including mass production methods as applied to airplanes and tanks, movable bridges, traffic problems, construction of concrete storage bins, and shales.

Virginia Military Institute

In spite of the wartime difficulties common to every college campus—namely, rapidly changing personnel and an accelerated program—the Chapter at Virginia Military Institute had a successful year. The usual programs with student papers were temporarily abandoned, and outside speakers and motion pictures substituted. These were carefully selected to supplement the regular curriculum. Permission was secured for the advanced civil engineering students at the college, under the A.S.T.P., to become members of the Chapter. These men, coming from engineering colleges all over the country and often possessing considerable field and office engineering experience, were a great asset to the Chapter. Their representatives were elected to the governing committees and helped make the programs a real success.

Group from V.M.I. Chapter on Inspection Trip

Outstanding among the speakers were Lt. Col. Paul D. Troxler, an alumnus, with his informal talk on the trans-Iran railroad and the shipping of supplies to Russia, and Maj. C. B. Welch, of the Corps of Engineers, with his lecture and demonstration on booby traps and land mines. Notable were the inspection trips to the Lehigh Cement plant at Fordwick, Va., and the all-day trek to the new U.S. Rubber Company's plant of the vault type at Scottsville and the big steam generating plant of the Virginia Electric Power Company at Bremo Bluff.

The Chapter paid warm tribute to Contact Member E. M. Hastings, saying "His faith and leadership are like a light to guide us through a troubled world."

ITEMS OF INTEREST

About Engineers and Engineering

Colleges to Get $2^1/_2$ Million for Research

SCIENTISTS who made the atomic bomb, radar, and a host of other vital war weapons, will have a chance to return promptly to college laboratories for scientific research and teaching through $2,500,000 in grants offered to educational institutions by Research Corporation, of New York, a non-profit organization devoted to advancing research and technology by use of revenues from inventions assigned to it by public-spirited inventors.

HELP FOR SMALLER COLLEGES

Preference in making these grants will be given, other factors being equal, to smaller institutions and those of more limited financial resources for research. The five-year program announced by Dr. Joseph W. Barker, acting president, who has returned to his duties with the Corporation and with Columbia University from service as Special Assistant to the Secretary of the Navy, will result in 100 to 200 grants of $2,500 to $5,000 each year in order that talented young scientists, engaged for the most part in war research in uniform or as civilians, will be able to undertake at universities and colleges research of peacetime importance in pure science, especially chemistry, physics, mathematics, and engineering.

The first grants will be made in a few weeks by a special committee of eminent scientists from industrial and university laboratories. The committee is composed of Acting President Barker, who is also Dean of Engineering at Columbia University; Dr. Thomas H. Chilton, director of engineering for duPont; Dr. William D. Coolidge, X-ray consultant for General Electric Company; Timothy E. Shea, manufacturing engineer of Western Electric Company; Dr. Lloyd P. Smith, associate research director of Radio Corporation of America; Col. Stafford L. Warren, Professor of Medicine at the University of Rochester; and Dr. Robert R. Williams, inventor of the synthesis of vitamin B_1 and coordinator of the research of Research Corporation.

Grants will be made to the institutions at which the scientists will work and teach. The funds allotted will be available for the purchase of needed equipment and for employment of assistants either as Fellows or otherwise. Awards will be based primarily upon the demonstrated ability of the men who will conduct the researches and contribute to the teaching program of the school.

"For the past four or five years," said Dr. Barker, "the Government, through the Office of Scientific Research and Development, the National Defense Research Council, the Army, the Navy, and the Air Force, has supported a vast research and development program into which has been drawn the great majority of the most competent university research men. Already the demobilization of these research projects is under way. When their war jobs are finished many of these talented young scientists should be going back to college laboratories and lecture rooms to train and inspire the next generation of scientists."

The grants are made possible by the fact that during the war years research programs that would be normally supported by Research Corporation grants have been laid aside in order to free men and facilities for war research.

Research Corporation was begun in 1912 with the gift, through Dr. F. G. Cottrell, of patent rights on electrical precipitation, which is used for removing dust, fume, and mists from industrial gases and from the atmosphere. From revenues derived from these and other patents it has made grants of $1,279,637 in past years to 52 institutions. In recent years Research Corporation has served universities by administering inventions that may arise in their laboratories.

To scientists of the Office of Scientific Research and Development, Army, Navy, and other war research agencies, the possibilities of these grants are being made known with an invitation to send applications to Dr. Robert R. Williams, Research Corporation, 405 Lexington Avenue, New York 17, N.Y.

Sound Film on Causes of Construction Accidents

"CONSTRUCTION Equipment Safety," a new sound slidefilm especially devoted to accident prevention in the heavy construction industry, has just been completed by the National Safety Council.

"Construction Equipment Safety" covers the causes of most accidents in the use of such equipment as bulldozers, cranes, tractors, cats, steam shovels, dump trucks, and similar machines. It points out that the most effective means of preventing these accidents is to follow a few simple rules that are generally applicable, and to rely on common sense to meet the unexpected situations which arise during the course of a job.

During 1944, about 1,800 workers met death by accidents on construction work, the Council reports. While such work employs only 2% of the nation's total number of workers, the Council points out that these 1,800 deaths represent 10% of the total number of deaths to workers in all industries. The death rate in the construction industry is the second highest of all the major industrial groups and is nearly $4^1/_2$ times greater than the average rate of all industrial groups.

A manual has been prepared by the Council as an aid to quizzes and group discussions on construction-accident prevention following showings of the film.

National Safety Council Photo

CRANE OPERATOR BUILDING UP A BIG LETDOWN AS HE DIGS HIMSELF OUT FROM UNDER

Further information on this sound slidefilm may be obtained from the National Safety Council, Inc., 20 North Wacker Drive, Chicago 6, Ill.

Model of Normandy Prefabricated Port to Tour Canada

SHORTLY Canadians will see proof of the connection between the raid at Dieppe and the successful invasion of Europe. The War Office model of the prefabricated port which, towed to Normandy, made D-day possible, is being brought to Canada for a tour embracing twelve cities from coast to coast. The Dieppe experience supplied essential information which not only proved the necessity of a clear harbor for the invasion but also aided in plans for it. To those on the inside the harbor has been known for almost three years under the code name of "Mulberry."

"Mulberry" was perhaps the war's greatest secret. Conceived, designed, and built by the British, it was one of the greatest engineering projects in the world's history. It shortened the war by many months and saved countless lives.

The exhibition coming to Canada is the original War Office operations model, and requires three box cars for shipment. It will be accompanied by Royal Engineer officers from the War Office—men who have lived with the project from its inception.

This model has been shown previously only in London and Paris, and goes to Canada direct from the latter city. Its Canadian tour, under the sponsorship of the Hudson's Bay Company, in collaboration with the Engineering Institute of Canada, will require almost an entire year.

N. G. Neare's Column

Conducted by

R. ROBINSON ROWE, M. AM. SOC. C.E.

THE ROUND table at the Engineers Club had debated the question of who won the war—Russian manpower, British fortitude or American knowhow. The consensus was that the engineers won but that others are doing the most talking. We are more interested in getting the boys home. Since this was the theme of Guest Professor Steinmance's debarkation problem, Professor Neare interrupted to ask him to process the solution.

"I recall," began the Guest Professor, "that the process is to start with Joe Kerr's facetious or amateurish. . . ."

"Don't rub it in," begged Joe. "I try hard and I've been studying diophantines, like your problem, which reduces to:

$$701\ a + 11 = 698b + 7 = 612c + 1 = N = xd < 698d$$

It's not hard to find that $a = 1{,}162$, $b = 1{,}167$, $c = 1{,}331$ and $xd = 814{,}573$, the strength of the army. Maybe 814,573 can be factored, but I'd let the boys paddle home in 814,573 sponsons. At least they wouldn't complain of KP duty."

"Joe forgot the 'no casuals' condition," objected Ken Bridgewater. "Lehmer's factor table shows that $x = 647$."

"And Ken implies that Lehmer's table can be found in the USO library," said Cal Klater. "Such cribs being tabu, I factored with primitive tools. By one method, I listed all primes under 698 and tabulated linear residues to an index of 100, then divided by sliderule by the primes until I found a quotient agreeable to the corresponding residue. By another, I found the sum of the series $-17, -16, \ldots -1, 0, +1, \ldots 1{,}276$ was $814{,}573 = {}^1/_2(1276 - 17)(1276 + 17 + 1) = {}^1/_2 \cdot 1259 \cdot 1294 = 1259 \cdot 547$."

"Good," exclaimed the Guest Professor. "Since experts claim that the only rigorous analysis is successive division by primes up to $\sqrt{N}$ you may be interested in another expedient that is quick for certain ranges of factors.

"I use the equation $abN = p^2 - q^2 = (p + q)(p - q)$, where q is small, $a - b$ is even and $b \lessgtr 1$. Trying successive values of p above $\sqrt{abN}$, compute $p^2 - abN$ until the difference is a square, whence the factors follow. If no such square is found up to the limit Q of the table of squares, then there are no factors in the range (approximately) from $\sqrt{\frac{bN}{a}} - \frac{Q}{a}$ to $\sqrt{\frac{bN}{a}} + \frac{Q}{a}$. By designed selection of a and b, a series of such ranges will cover all possibilities. Very few values of p need be tried if quadratic residues are used as excludants.

"In the particular case, when $a = 4$ and $b = 2$, $abN = 6{,}516{,}584 = 2{,}553^2 - 35^2 = 2{,}588 \cdot 2{,}518 = a \cdot 647 \cdot b \cdot 1{,}259$. Can you add anything, Noah?"

"Just that the complete solution to Joe's diophantine is $N = 814{,}573 + 149{,}725{,}188k$. Practically for this man's army, $k = 0$; when $k = 1$, $N = 150{,}539{,}761$, giving the solutions $x = 23$ and $x = 569$. In all, there are 217 solutions, $-5, 7, 11 \ldots 695$.

"Some of that army joined the Armistice Day parade in Esseyeville. The columns of Army Engineers and Navy Seabees marched 11 abreast with full ranks, but this wasn't because of the date 11-11-45. Had they marched 8 abreast, Seabee ranks would have been full, but an Engineer would have been left over; if 7 abreast, Engineer ranks would have been full, but one Seabee would have been left over; similarly for 2, 3, 4, 5, 6, 9 or 10 abreast. How many were in each column?"

[*Cal Klaters were Richard Jenney, Ann Othernut (J. Charles Rathbun and his slide rule), G. H. Wilsey, Oldcutandtry (Warner Harwood), John L. Nagle, Walter L. Shilts, E. P. Goodrich, Isidore Knobbe (Jos D. Lambie and his series), Jesse P. Walton, L. W. Armstrong, and Lawrence E. Goodman. Guest Professor Steinmance is still D. B. Steinman.*]

New Registration Law in Pennsylvania

REVISED definitions, examinations, and an "Engineer-in-Training" provision feature the engineers registration law recently enacted by the Pennsylvania State Legislature. The new act becomes effective on June 30, 1946, thus giving opportunity for those who prefer it, to apply for registration under the terms of the old law. The intent of the new law is to establish beyond question the professional status of the registered engineer.

The new law (Act No. 367) was prepared after court decisions in Dauphin County (Pa.) courts had shown the previous act to be inadequate. This act was passed in 1927. The most serious objection of the courts was to the definitions of engineering practice, which were held to be vague and indefinite. New definitions are more explicit and have been broadened to permit licensing of newer fields of engineering which are not entirely included within the scope of the main branches of the profession.

The Registration Board is given power to license engineers without examination when such engineers are licensed in other states with which a reciprocal relationship exists. The act also provides for the practice of engineering by firms as corporations, an arrangement not permitted under the old law.

New in Education~

New Veterans Guidance Center Opens at Stevens

A VETERANS Administration Guidance Center at Stevens Institute of Technology, Hoboken, N.J., has been established. Captain Elmer Klinsman is chief of the center for the Veterans Administration, and the advisory group for Stevens Institute is under the directorship of Dr. Frederick J. Gaudet, Associate Professor of Psychology. It is the third such center to be authorized in New Jersey.

Its main purpose is to give advice or consultation along either vocational or educational lines to disabled veterans, but the service is also available to other veterans eligible for education under the "G.I. Bill of Rights." Guidance is given to individuals of all age levels and all ranks.

When a qualified veteran is referred to the college staff for guidance, he is first interviewed to determine his background—schooling, work experience, family situation, hobbies, service training, etc. He is then sent to the psychometrician (testing psychologist) who gives him various tests to determine, in so far as possible, mental and manual skills, aptitudes, and interests. Next, he meets with the appraiser, who decides in consultation with him the occupation for which he is best fitted, and what training he should take, if any. He is also given general advice about the business or professional field in which he has chosen to study.

When the records are completed, they are turned over to the Veterans Administration Adviser in charge of the center. He makes the necessary certification and forwards the file to the Regional Office. There action is taken to place the veteran in training for the objective that has been selected.

Los Angeles Plans for Civic Development and Public Works

ENVISIONING an early return of intolerable traffic conditions, Los Angeles is making exhaustive studies to determine both permanent and stop-gap parking remedies. The initial study, the work of the Downtown Business Men's Association of Los Angeles, indicates the growing interest of merchants in meeting the parking problem before it reaches pre-war proportions. Through the American Retail Federation, copies have been distributed to selected merchants and public officials throughout the country to stimulate interest in planned parking programs. This "Downtown Los Angeles Parking Study," as printed for the Downtown Business Men's Association, is on file in the Engineering Societies Library, 29 West 39th Street, New York 18.

Another planning study has recently been issued by the Haynes Foundation. It is entitled "Coordinated Public Works for Metropolitan Los Angeles," by Dr. George W. Bemis. In it he proposes a Public Works Review Board—composed of representatives of federal, state, county, and municipal agencies—to review all projects of region-wide importance and advise the interested agencies on coordination of their proposals in timing and location.

This report outlines new large-scale projects authorized or in immediate prospect for the region for highways and

freeways ($600,000,000); airports; ports and harbors; parks and recreational facilities; flood control projects ($244,000,000); and sewage disposal. It is available in pamphlet form on request to the Haynes Foundation, 2324 South Figueroa Street, Los Angeles 7, Calif., for 10 cents a copy.

Another pamphlet currently available from the Haynes Foundation is entitled "Parks, Beaches, and Recreational Facilities for Los Angeles County." It is a report of the County Citizens Committee on Parks, Beaches and Recreational Facilities, and gives the Committee's recommendations for the organization of a Commission or District to (1) coordinate plans and programs of all agencies concerned with recreational facilities within the County of Los Angeles; (2) acquire additional parks, beaches, etc.; (3) develop such facilities of more than local significance; and (4) assist in the operation of such facilities where desirable. Also included is a summary of existing recreational facilities in Los Angeles, future needs of the area, and an appendix discussing the experience of other metropolitan areas in this field. This pamphlet is also 10 cents.

Registration of Professional Engineers in New York State

DURING the year ending June 30, 1945, the New York State Board of examiners for Professional Engineers considered 1,018 applications, of which 42 were rejected, 485 held for final written examinations, 99 assigned to preliminary examinations, 68 held for further consideration, 71 certified as having passed the preliminary examinations, and 253 recommended for licenses (including those who passed the examinations).

At the June 1944 preliminary examinations (for Engineers-in-Training), 38 passed out of 62 candidates. At the February 1945 preliminary examinations, 33 passed out of 52 candidates, bringing the total certified as Engineers-in-Training in New York State up to 142.

Engineers in the Armed Services

A FEW of the achievements of engineers in the Armed Services have been recorded in three interesting pamphlets recently received at Society Headquarters. One of these, entitled "Aviation Engineers in Mobile Warfare," highlights the vital part played by the Ninth Engineer Command in blazing a trail of airfields across the Continent, thus contributing to the successful operations of the Ninth Air Force.

Another pamphlet—"The Ninety-Second Naval Construction Battalion Log"—was edited, printed, and distributed on Tinian, Marianas Islands, where the Battalion spent many months. This volume tells, largely by means of photographs, the whole story of the Battalion. The running comment lists many of its accomplishments on the Marianas, including the construction of 16 camps; 35 miles of highway; Army and Navy hospitals; and, most important of all, the Tinian Air Base. Comdr. Joseph P. Lawlor, M. ASCE, is officer-in-charge of the Battalion.

In a slightly different category is the concluding (No. 24) issue of "The Air Force Engineer," which made its debut in July 1943, and for the subsequent two years was a successful medium of expression for the Aviation Engineer. A résumé of Aviation Engineer activity, giving a short historical account of each of the units contributing to the success of the African and Mediterranean campaigns, constitutes the closing number.

NEWS OF ENGINEERS

Personal Items About Society Members

EUGENE W. WEBER, lieutenant colonel, Corps of Engineers, U.S. Army, is a recent recipient of the Legion of Merit for his "outstanding services" during the period from July 1944 to May 1945. Serving at that time at the headquarters of the European Theater of Operations, Colonel Weber was largely responsible for the development of a "supply movement program" that was instrumental in the successful transportation of personnel, equipment, and supplies. Colonel Weber also holds the Bronze Star Medal and the French Croix de Guerre with Gold Star. Since his return from overseas in June 1945, he has been assigned as an assistant in the Civil Works Division of the Office of the Chief of Engineers in Washington, D.C.

FREDERICK H. DECHANT announces that he has reopened engineering offices in the Fidelity-Philadelphia Trust Building in Philadelphia, in association with FREDERIC R. HARRIS, New York City consultant. Mr. Dechant will also be in charge of the Philadelphia office of Frederic R. Harris, Inc., located at the same address. Before entering the U.S. Navy, from which he was recently discharged with the rank of commander, Mr. Dechant conducted the engineering business of William H. Dechant and Sons in Reading and Philadelphia.

C. F. HOSTRUP has joined the staff of Koebig and Koebig, Los Angeles consulting firm, with offices in the Rowan Building. He will specialize in waterworks and sewage-works engineering for the firm, which is primarily engaged in municipal engineering in the Southern California area. During the war Mr. Hostrup was in charge of water works and sewage engineering for various military projects.

LOUIS S. DOZIER, commander, Civil Engineer Corps, U.S. Naval Reserve, is directing all Seabee operations in Tokyo Bay, Japan. His battalion—the 136th Naval Construction Battalion—participated in the original landings on August 30, being the first Seabee outfit to land on the Japanese homeland. The performance of the battalion during the original occupation period earned for Commander Dozier a citation from Admiral Halsey, with the award of the Commendation Ribbon. Commander Dozier will return to this country soon.

A. A. KALINSKE has resigned as associate professor of hydraulics and associate director of the Iowa Institute of Hydraulic Research at the University of Iowa, in order to join the engineering staff of the Cleaver-Brooks Company, of Milwaukee, Wis.

HOWARD J. CARLOCK, formerly senior engineer for Ellwood H. Aldrich, of New York, N.Y., has been appointed chief engineer of the Bogert-Childs Engineering Associates, New York City consulting firm.

BENJAMIN A. MORGAN, JR., until lately a captain in the Corps of Engineers, U.S. Army, has accepted a position in the engineering department of the Celanese Corporation of America, with headquarters in Bridgewater, Va. Prior to entering the service in 1942, Mr. Morgan was employed as resident engineer for J. E. Sirrine and Company, of Greenville, S.C.

G. B. DRUMMOND has been appointed assistant state engineer of New Mexico. Since his return from the military service Colonel Drummond has been teaching at the University of Texas and the University of New Mexico.

HENRY W. HEMPLE, hydrographic and geodetic engineer for the U.S. Coast and Geodetic Survey, has been appointed chief of the Division of Geodesy of the Survey. In this new capacity Commander Hemple will succeed CAPT. CLEMENT L. GARNER, who retired on October 1 as chief of the Division. On the same date another member of the Society, CAPT. GILBERT T. RUDE, retired as chief of the Division of Coastal Surveys after 42 years in the service of the Survey.

CHEN-HSU T'ANG has resigned as engineer and liaison secretary in charge of research, inquiries, and publications for the Universal Trading Corporation, the Chinese government purchasing agency in the United States. In September he joined the National Resources Commission of China as their technical expert in the Department of Industrial Enterprises, and is awaiting transportation to Chungking. He may be addressed in care of the Commission, Room 515, 111 Broadway, New York 6, N.Y.

HOWARD P. MAXTON has left the Bureau of Yards and Docks in Washington, D.C., in order to join the staff of the Raymond Concrete Pile Company, in New York. Since 1940 Mr. Maxton has been engaged in the construction work of the Navy's war program, particularly on the cost-plus-a-fixed-fee contracts.

THOMAS B. LARKIN, major general, Corps of Engineers, U.S. Army, has been appointed commanding general of the Second Service Command, with headquarters at Governor's Island, N.Y. General Larkin recently returned after three years in the European Theater of Operation.

Fred D. Hartford, who is on the staff of the Public Roads Administration, was recently transferred from San Francisco to Santa Fe, N.Mex., where he will be in charge of bridge work for the Administration.

John A. Blume has established his own designing and consulting practice at 68 Post Street, San Francisco. Until lately he was structural engineer for H. J. Brunnier, of the same city.

David S. Gendell, Jr., is retiring as general manager of erection for the Bethlehem Steel Company after 45 years of continuous service with that organization. During this long period Mr. Gendell has supervised the erection of the structural steel for many notable structures, including the George Washington Bridge in New York and the Golden Gate Bridge in San Francisco.

James W. Bradner, Jr., recently resigned as regional director of the Federal Works Agency at Fort Worth, Tex., in order to accept an appointment as city manager of Waco, Tex.

Bruce G. Johnston has resumed his duties as associate professor of the Fritz Laboratory at Lehigh University and has also been made professor of civil engineering at the university. Dr. Johnston has been on leave of absence from the laboratory for the past three and a half years, serving as engineer on a number of war projects with the Johns Hopkins Laboratory of Applied Science.

Jack Singleton, who has just been released from active duty in the Corps of Engineers, U.S. Army, in which he had the rank of lieutenant colonel, has accepted an appointment as chief engineer for the American Institute of Steel Construction, with headquarters in New York City. A veteran of both World Wars, Colonel Singleton has for the past two years been chief of the Bridge Branch, Office of the Chief of Engineers, in charge of all military bridge construction for the Army. Prior to assuming active duty, Colonel Singleton was for 14 years district engineer for the American Institute of Steel Construction.

Enoch Bluestone announces that he has opened an office at 150 Nassau Street, New York 7, N.Y., for the practice of structural engineering in association with his father, Abraham Bluestone, formerly an engineer with the New York City Department of Housing and Buildings. Until lately Mr. Bluestone was structural engineer for the Leonard Construction Company and Sanderson and Porter, of New York City.

J. M. R. Fairbairn, retired chief engineer of the Canadian Pacific Railway, is the recipient of the Sir John Kennedy Medal for 1945, given in "recognition of outstanding merit in the profession." The medal commemorates the great services rendered to the profession by the late Sir John Kennedy, past-president of the Engineering Institute of Canada. Mr. Fairbairn is also a past-president of the Institute and an Honorary Member of the Society.

Eugene Reybold, lieutenant general, U.S. Army, has retired as Chief of Engineers and accepted a connection with the Delaware State Highway Department in the capacity of head of the newly created Delaware River Crossing Division. He will have offices in Washington, D.C., and Wilmington, Del. General Reybold served

Eugene Reybold

as Chief of Engineers from August 1941 until September 1945, a period embracing all the enormous construction projects of the war years.

George D. Whitmore has resigned as chief of surveys, Maps and Surveys Division of the Tennessee Valley Authority, in order to accept a position with the Topographic Branch of the U.S. Geological Survey in Washington, D.C. In this new position Mr. Whitmore will have administrative charge of mapping work all over the United States.

James H. Mainey is now maintenance engineer for three divisions of the Ohio State Highway Department. He was previously resident engineer for the Department at Painesville.

Leslie A. Pettus, until lately division engineer for the St. Louis (Mo.) Board of Public Service, has accepted the position of manager of the Dayton (Ohio) Engineers' Club.

John A. Long, recently released from the U.S. Army, has returned to his former position as manager of the County Highway Officials and Municipal Highway Officials divisions of the American Road Builders Association. For the past three years he has been in the Ordnance Department, having the rank of major.

Charles W. Kutz, brigadier general, Corps of Engineers, U.S. Army, has retired from his position as Engineer Commissioner for the District of Columbia. He will be succeeded by Brig. Gen. Gordon R. Young.

Marcel Garsaud, consulting engineer of New Orleans, La., has accepted the position of director of the Greater Miami (Fla.) Port Authority.

Frank E. Fahlquist has severed his connection as senior geologist for the U.S. Engineer Office at Providence, R.I., in order to establish a consulting practice at Riverside, R.I.

William D. Dockery, until lately district engineer for the Texas State Highway Department at Del Rio, Tex., has been promoted to the position of district engineer at Austin.

L. C. Urquhart, whose temporary promotion from the rank of lieutenant colonel in the Corps of Engineers, U.S. Army, to that of colonel was announced in the October issue, has for several months been chief of the Engineering Division, Office of the Chief of Engineers, Washington, D.C.

Charles P. Gross, major general, Corps of Engineers, U.S. Army, will succeed John H. Delaney as chairman of the New York City Board of Transportation. General Gross, who is chief of the Army Transportation Corps, is now arranging his retirement from the Army and will be sworn in as a member of the Board as soon as he is released.

James H. Turner has severed his connection as manager and chief engineer of the Hetch Hetchy Water and Power Bureau in San Francisco, Calif., in order to assume the position of manager of San Francisco public utilities.

Frederick W. Clayton, previously employed at the Navy Ammunition Storage Depot at Hawthorne, Nev., has established his own consulting office at 301 Byington Building, Reno, Nev.

Walter T. Norris has reopened the office of the American Institute of Steel Construction in the Russ Building, San Francisco. For the past several years he has been construction engineer and project manager for the San Francisco office of the Bureau of Yards and Docks.

Russell G. Hackett is now structural engineer for the Pacific Fruit Express. Until lately he was senior engineer for the Federal Power Commission in San Francisco.

John C. Beebe, formerly regional engineer for the Federal Power Commission in San Francisco, is now in Coeur d'Alene, Idaho, acting as special assistant to the Federal Power Commissioner.

Joseph S. Malek, first lieutenant, Corps of Engineers, U.S. Army, is a recent recipient of the Bronze Star Medal for his work as officer in charge of the photomapping section of the 654th Engineer Topographic Battalion in the European Theater of Operation. Before entering the service Lieutenant Malek was assistant structural engineer in the U.S. Engineer Office at Providence, R.I.

Philip B. Streander, formerly sanitary engineer for the Stone and Webster Engineering Corporation, of Boston, Mass., has established a consulting practice at 46 Cornhill, Boston 8. His specialty will be water supply and sewage and refuse disposal.

Harold W. Baker, who is being released from the Civil Engineer Corps of the U.S. Navy, in which he held the rank of commander, will accept a connection as safety engineer for the Eastman Kodak Company in Rochester, N.Y. Prior to

entering active service in 1941, Commander Baker was city manager of Rochester.

JULIAN L. SCHLEY, major general, U.S. Army, was recently appointed executive director of the Baltimore (Md.) Aviation Commission, in which capacity he will direct a large airport improvement program for the city. General Schley was Chief of Engineers from 1937 to 1941, and of more recent years has been in the Office of the Coordinator of Inter-American Affairs, in Washington, D.C.

EZRA B. WHITMAN has just retired as chairman of the Maryland State Roads Commission, after serving in that capacity since 1939. However, he will continue to head the Baltimore firm of Whitman, Requardt and Associates, with which he has been affiliated for many years. Mr. Whitman served as President of the Society in 1943.

HERBERT GOODKIND, major, Corps of Engineers, U.S. Army, was decorated with the Bronze Star Medal at a recent ceremony held at Communications Zone Headquarters in Paris. Major Goodkind received the decoration for his part in planning the crossing of the Rhine.

EMIL C. JENSEN is now chief of the division of public health engineering in the Washington State Department of Health. He was previously senior public health engineer.

EDWARD F. BROWNELL, major, Corps of Engineers, U.S. Army, has been appointed post engineer at Camp Ellis, Minn.

WILLIAM H. OWEN was recently made head of the field engineering and building inspection department of William S. Lozier, Inc.—Broderick and Gordon, managing firm for the Sunflower Ordnance Works at Eudora, Kans. He was formerly senior engineer assistant to the head of the department.

HORACE H. PERSON is now a major in the Corps of Engineers, U.S. Army, the rank representing a promotion from that of captain. He is executive officer for the U.S. Engineer Office at Portland, Ore.

JOHN CLIFFORD BISSET, lieutenant colonel, Corps of Engineers, U.S. Army, is returning to his former post as director of the Dallas (Tex.) Department of Public Works after three years in the service.

JOHN M. PAGE, who is on the staff of the Public Roads Administration, was recently transferred from Little Rock, Ark., where he was senior highway engineer, to Austin, Tex., where he will be district engineer for Texas.

CARL V. YOUNGQUIST, formerly district engineer for the U.S. Geological Survey at Columbus, Ohio, has accepted a position as chief of the Ohio Board of Water Supply.

BEVERLY C. DUNN, brigadier general, Corps of Engineers, U.S. Army, has been appointed division engineer at Columbus, Ohio. For the past two years General Dunn has been in the European Theater of Operations.

JOHN C. KING, JR., who has been serving overseas in the Corps of Engineers, U.S. Army, in which he held the rank of major, has been released from the service and has accepted a position as engineer for the International Engineering Company, Inc., in Denver, Colo.

JAMES T. HENDRICKS was recently promoted from the rank of ensign in the Civil Engineer Corps of the U.S. Naval Reserve to that of lieutenant (jg). He is in the Admiralty Islands in the Pacific. Before entering the service Lieutenant Hendricks was assistant field engineer for the Tennessee Valley Authority.

LEWIS C. WILCOXEN, until lately in the Civil Engineer Corps of the U.S. Naval Reserve, with the rank of lieutenant commander, has returned to his position in the Detroit (Mich.) City Engineer's Office. While in the service he was in the Automotive and Construction Equipment spare parts activities, and for the past year and a half was stationed at Adak, as officer-in-charge of the Aleutian spare parts unit.

CHARLES M. NOBLE, commander, Civil Engineer Corps, U.S. Naval Reserve, is now deputy director of the Advance Base Department, Bureau of Yards and Docks, Washington, D.C. Commander Noble holds the Bronze Star Medal for service during the summer of 1944 in enemy-dominated territory in the Far East, and the Legion of Merit in connection with the construction of naval bases and airfields in the Aleutians.

ALEXANDER V. KARPOV, serving since 1943 with the Foreign Economic Administration, has been released to resume private engineering practice. Formerly a consultant with headquarters in Pittsburgh, Pa., Mr. Karpov has reestablished his practice with an office in New York City. His specialty is now industrial and power developments. He has also been elected vice-president of the King Design and Construction Co., of New York City. While serving with the FEA, Mr. Karpov made surveys of power and phosphate resources in Africa and power resources in Germany. His report on power in North Africa is being published by the Committee on African Studies of the University of Pennsylvania.

DECEASED

ROBERT EDWARD BARRETT (M. '19) president and treasurer of the Holyoke Water Power Company, Holyoke, Mass., died in a hospital in Springfield on October 13, 1945. His age was 64. Mr. Barrett served as a designer on the construction of the Catskill water supply system for New York from 1907 to 1914, resigning in the latter year to accept the newly created post of designing engineer for the Directors of the Port of Boston (now the Massachusetts Commission). In 1917 he was appointed construction engineer for the Turners Falls Power and Electric Company, and from 1920 on he was connected with the Holyoke Water Power Company—since 1923 in the capacity of president and treasurer.

ARCHIE EDMUND BUMP (M. '21) retired engineer of Brookline, Mass., died at his summer home in Hingham, Mass., on September 21, 1945. Mr. Bump, who was 69, spent his entire career with Swift and Company, of Chicago. From 1908 until his retirement in 1940 he was manager of the construction and engineering department of the Eastern division of the organization, with headquarters in Boston.

HARRY EDMOND COTTON (M. '32) drainage engineer for Armco Drainage and Metal Products, Inc., Middletown, Ohio, died suddenly in that city on October 12, 1945. He was 64. Mr. Cotton's early engineering work was with the city of Omaha, Nebr., where he later became assistant city engineer. He joined the Armco Culvert Manufacturers' Association in 1928, and in 1931 transferred to the New England Metal Culvert Company at Boston. In 1936 he returned to the Association at Middletown, where he continued to specialize in airport and highway subdrainage and sewer design.

ALVAH BENJAMIN DIEHR (M. '09) retired civil engineer of Nevada, Mo., died in a hospital there on October 6, 1945, at the age of 79. For twenty-seven years Mr. Diehr was in the U.S. Engineer Office at Memphis, Tenn., engaged in river improvement and flood control work. He then held the position of assistant superintendent in charge of building the first unit of the San Pedro (Calif.) breakwater. Returning to Vernon County (Missouri), where he had spent his youth, Mr. Diehr served for four years as county surveyor and for five years as county highway engineer. Later he was for some years chairman of the Vernon County Highway Commission. He was a veteran of the Spanish-American War.

FREDERICK HALL FOWLER (M. '24) Past-President of the Society and San Francisco consultant, died in Palo Alto, Calif., on November 7, 1945. A biographical sketch and photograph of Mr. Fowler appear in the Society Affairs section of this issue.

ROBERT JACOB GEHRON (Jun. '44) private, U.S. Army, died in a hospital in Manila, P.I., on September 23, 1945, at the age of 22. He was with the 1576 Engineer Photomapping Patrol. Mr. Gehron graduated from the Carnegie Institute of Technology in 1944, receiving a bachelor of science degree in civil engineering. Soon after graduating he entered the Army, leaving for the Pacific area in July of this year. His home was in Williamsport, Pa.

STUART CHAPIN GODFREY (M. '21) brigadier general, Corps of Engineers, U.S. Army, was killed in an airplane crash near Spokane, Wash., on October 19, 1945. He was 59. A graduate of the U.S. Military Academy in 1909, General Godfrey had been in the regular Army for 36 years. During this period he was district engineer at Boston, Mass., and Memphis,

Tenn., and department engineer for the Panama Canal Department. He saw overseas duty in both World Wars—in the recent war as air engineer, Air Service Command, China-Burma-India Theater, from November 1943 until September 1945. In the latter capacity he directed construction of some of the first B-29 bases in that theater of war. A few months ago he took command of Geiger Field at Spokane.

THOMAS CORWIN GUYN (M. '33) senior engineer for the U.S. Indian Irrigation Service, San Francisco, Calif., died suddenly in Salt Lake City, Utah, on August 19, 1945, at the age of 59. Mr. Guyn was with the U.S. Indian Irrigation Service from 1918 on—until 1926 on the Wapato (Wash.) Project, and later in charge of projects in Utah and Idaho. He had been in the San Francisco office since 1939. Coincidentally, for part of this period (1918 to 1923) he was also engaged on highway location and construction for the Coolidge Dam project in Arizona.

JOSEPH STANISLAUS KRYSHAK (Jun. '41) first lieutenant, Air Corps, U.S. Army, was killed in an airplane crash at Guam on July 9, 1945, while starting on a mission against the enemy. He was 27. Before enlisting in the Army Air Force in January 1943, Lieutenant Kryshak was a civil engineering draftsman for the Tennessee Valley Authority at Chattanooga and Knoxville. He was a member of the 502d Bombardment Group, being flight engineer on a B-29. His home was at Stevens Point, Wis.

HENRY ALEXANDER LEEUW (M. '38) superintendent for Allen N. Spooner and Son, Inc., of New York, N.Y., died in a hospital there on October 18, 1945. Mr. Leeuw, who was 52, had been with the Spooner organization for over 22 years. During this period he was active in the construction of piers and bulkheads and other harbor installations. Earlier in his career he was engaged on the building of the Hudson Tube for the Hudson and Manhattan Company and the dirigible hangar at the U.S. Naval Station at Lakehurst, N.J.

LESTER CHIPMAN MCCANDLISS (M. '35) professor and head of the department of civil engineering at the University of Pittsburgh, Pittsburgh, Pa., died at his home there recently. His age was 59. Professor McCandliss had been at the University of Pittsburgh since 1912, with the exception of a period spent in overseas service in the first World War—he was a captain with the Fifteenth Engineers. During the recent war he was in charge of the civil engineering training of thousands of civilian war workers. In 1916 Professor McCandliss supervised the construction of a camp for student engineers at Windber, Pa., and had been in charge of the camp since then.

HIRAM MILLER (M. '29) of Bangor, Me., died on October 14, 1945, at the age of 65. Mr. Miller spent his early career (1901 to 1909) on railroad location and construction in Mexico and South America. He then became connected with the Alabama Power Company, and from 1922 to 1931 was designer and assistant hydraulic engineer for the Electric Bond and Share Company. Later he was in the U.S. Engineer Office in New York, and designer for the American Gas and Electric Company, also in New York. His most recent position (1937 to 1940) was with the Puerto Rico Reconstruction Administration on the design of hydroelectric developments in Puerto Rico.

WILLIAM ELTON MOTT (Assoc. M. '02) director emeritus of the engineering college at Carnegie Institute of Technology, died at Burlington, N.J., on October 5, 1945. His age was 77. Early in his career Dean Mott taught at Cornell University and his alma mater, the Massachusetts Institute of Technology. In 1909 he went to the Carnegie Institute of Technology as professor of civil engineering in charge of the department, and from 1917 until his retirement in 1932 he was dean of the engineering school there.

ARTHUR VALENTINE RUGGLES (M. '20) assistant hydraulic engineer for the New York State Public Service Commission, died in a hospital in New York City, on October 21, 1945. His age was 62. Mr. Ruggles had been with the New York City Board of Water Supply and the New York City Department of Water Supply, Gas and Electricity, and from 1922 to 1924 was water commissioner for the city of Cleveland, Ohio. Subsequently he was with the U.S. Cast Iron Pipe and Foundry Company, and from 1928 to 1936 was technical assistant to the secretary of the American Water Works Association. He had been with the New York State Public Service Commission since 1938. During the first World War Mr. Ruggles served overseas in the Corps of Engineers, U.S. Army, having the rank of captain.

WILLIAM FRASER TOMPKINS, JR., (Jun. '40) major, Corps of Engineers, U.S. Army, was killed in action in Germany on March 13, 1945. He was 25, and an alumnus of Tulane University, class of 1940. At the time of his graduation Major Tompkins was the recipient of the Louisiana Section's prize of Junior membership in the Society. He had been in the Army since 1942. His home was in Washington, D.C.

EDWARD EVERETT WELCH (Assoc. M. '28) traffic and planning engineer for the City of Sacramento, Calif., died at the Veterans' Hospital at Napa, Calif., recently. Mr. Welch, who was 57, had been in the employ of the city since 1923, when he became an engineer for the filtration plant. Later he was made traffic engineer, and since 1943 he had also been planning engineer.

DETHIC HEWITT WOOD (M. '10) retired engineer of Chattanooga, Tenn., died at his home there on November 3, 1945, at the age of 74. Early in his career Mr. Wood was engaged on the survey of Shiloh National Park, and as city engineer of Meridian, Miss. In 1895 he became associated with the late W. H. Converse as chief engineer for the Converse Bridge Company, of Chattanooga. In 1914 the company was reorganized as the Converse Bridge and Steel Company, and Mr. Wood was made president, remaining in that capacity until his retirement from active work in 1943.

Changes in Membership Grades

Additions, Transfers, Reinstatements, and Resignations

From October 10 to November 9, 1945, Inclusive

ADDITIONS TO MEMBERSHIP

ALLEIN, FRANCIS COOK (Assoc. M. '45), Capt., Corps of Engrs., U.S. Army; 1786 Carr Ave., Memphis, Tenn.

ARCHIBALD, RALPH STRONG (Jun. '45), Ensign, U.S.N.R.; 20 North Ave., Melrose, Mass.

BARBEAU, LIONEL MARCEL (Jun. '45), Prin. Eng. Aide (Civ.), U.S. Engr. Dept., 700 Union Guardian Bldg., Detroit, Mich.

BARRIS, JAMES PETER (Jun. '45), Ensign, U.S.N.R., 5860 Ridge Ave., Chicago 26, Ill.

BASCH, PETER HUGO (Jun. '45), Stress Analyst, Kellett Aircraft Corp., Chester Rd. and Baltimore Pike, Swarthmore College, Pa.

BENNETT, JOHN CHARLES (Jun. '45), Ensign, U.S.N.; 402 West Blackwell St., Dover, N.J.

BERGEN, MARTIN JOHN (Assoc. M. '45), Chf. Draftsman, E. I. du Pont de Nemours & Co., Inc., Nemours Bldg., Wilmington 98, Del.

BILLING, OLIVER DONALD (Jun. '45), 559 Oakland Ave., St. Paul 2, Minn.

BLAKE, DARRELL NORMAN (Assoc. M. '45), County Engr., Court House (Res., 634 Benton St.), Council Bluffs, Iowa.

BOBERG, IRVING ERNEST (M. '45), Chf. Engr., Chicago Bridge & Iron Co., 1305 West 105th St. (Res., 1633 West 107th St.), Chicago, Ill.

BORNSTEIN, DONALD SCHER (Jun. '45), Gen. Contr. (Ale Bornstein), 1217–1227 South Logan St. (Res., 1810 Bardstown Rd.), Louisville 5, Ky.

BOWEN, DEXTER PARKER (Assoc. M. '45), Mgr. of Erection, Chicago Bridge & Iron Co., Apartado 1348, Caracas, D. F., Venezuela.

BOYCE, RUSSELL IVAN (Assoc. M. '45), (Boyce Brothers), 12 North Main St., Wallingford, Conn.

BRODELL, IRWIN (Jun. '45), Ensign, CEC, U.S.N.R.; 2805 Erie St., South East, Washington 20, D.C.

BURNS, ROBERT EARL, JR. (Jun. '45), Ensign, CEC, U.S.N.R.; 33 Center St., West Haven, Conn.

CLARK, ROY LESLIE (M. '45), Engr. and Archt. (Nemmers, Clark & Spooner), 207 Masonic Temple Bldg., Des Moines 9, Iowa.

DIFFENDERFER, RICHARD BESSOR (Jun. '45), Ensign, CEC, U.S.N.R.; 314 Lakeview Drive, Collingswood, N.J.

DILLON, BEN ELLIS, (Jun. '45), Field Engr., State Highway Dept., 117 Miami, Coleman, Tex.

DONALDSON, JAMES ROBERT (Assoc. M. '45), Asst. Supt., L. G. Arnold Constr. Co., Eau Claire (Res., Mondovi), Wis.

EDENS, JEAN, JR. (Jun. '45), Structural Engr. (P-1), National Advisory Committee for Aeronautics, Langley Memorial Aeronautical Laboratory, Langley Field (Res., 414 Marshall St., Hampton), Va.

ESDORN, WALTER HENRY (M. '45), Engr., Rheinstein Constr. Co., 21 East 40th St., New York (Res., 33 Bonair Ave., New Rochelle), N.Y.

ESTES, EDWARD RICHARD, JR. (Jun. '45), Ensign, CEC, U.S.N.R.; 303 South Blvd., Richmond, Va.

FREIFELD, MURRAY (Jun. '45), Draftsman and Checker, Hardesty & Hanover, 101 Park Ave. (Res., 2295 Morris Ave.), New York 53, N.Y.

FULLERTON, RAY (Assoc. M. '45), Prin. Engr., Kaiser Engrs., 1924 Broadway, Oakland (Res., 343 Berkeley Park Blvd.,) Berkeley 8, Calif.

GALATIS, ANTHONY CONSTANTINE (Assoc. M. '39), Syngrou Av. 50, Athens, Greece.

GALLIMORE, JOHN ROBERT (Assoc. M. '45), Civ. Engr. and Contr., 51 Stetson St., Brookline Mass.

GARDNER, FREDERICK CARLTON (M. '45), Vice-Pres., Ebasco Services, Inc., 2 Rector St., Room 1538, New York 6, N.Y.

GHASWALA, SOLI KAIKOBAD (Jun. '45), Overseer, Public Works Dept., Secretariat (Res., "Edena", 105, Queen's Rd., Fort), Bombay, India.

GIBSON, ROBERT EWING (Assoc. M. '45), Contracts Engr., Design Dept., TVA, 308 Union Bldg., Knoxville, Tenn.

GOEPFERT, CARL WILLIAM (Jun. '45), Capt., Corps of Engrs., U.S. Army, 5208th Engr. Service Group Headquarters, Army Post Office 75, Care, Postmaster, San Francisco, Calif.

GRIFFIN, PHILIP GREGG (Jun. '45), With U.S.N.; 6460 Dennison St., Los Angeles 22, Calif.

HABERLY, FRANCIS STIMSON (M. '45), Cons. Engr., 122 South Michigan Ave., Room 1334, Chicago 3, Ill.

HASSINGER, JAMES EDGAR, JR. (Jun. '45), 2021 South Carrollton Ave., New Orleans 18, La.

HEBERT, ARTHUR (Jun. '45), Highland Rd., Tiverton, R.I.

HENDRICKS, GERALD FRANKLIN (Jun. '45), San. Engr., State Board of Health, 1098 West Michigan St., Indianapolis, Ind.

HERBST, HENRY WILLIAM (Jun. '45), Ensign, U.S.N.R.; 8531 Sycamore St., New Orleans, La.

HOLDHUSEN, JAMES STAFFORD (Jun. '45), With U.S.N.; Houghton, S. Dak.

JENSEN, ALFRED (Assoc. M. '45), Asst. Prof., Gen. Eng., 305 Education Hall, Univ. of Washington, Seattle 5, Wash.

KAPLAN, BERNARD (Jun. '45), Private, U.S. Army; 510 Ocean Parkway, Brooklyn 18, N.Y.

KOOBAREFF, VICTORINE WILLIAM (Assoc. M. '45), Naval Arch., U.S. Navy Dept., Hunters Point (Res., 187 Harbor Rd., Bldg. 8, Section I), San Francisco 24, Calif.

KRAMSKY, MEYER (Assoc. M. '45), Maj., Corps of Engrs., U.S. Army; 3017 Riverdale Ave., New York 63, N.Y.

LATHROP, SIDNEY PRATT (Assoc. M. '45), Gen. Contr. (Frank Watt Constr. Co.), 2020 North East 58th Ave. (Res., 8751 South West 19th Ave.), Portland, Ore.

LEVINE, HERBERT (Jun. '45), Civ. Engr., Civ. Aeronautics Administration, 385 Madison Ave., New York (Res., 1489 East 8th St., Brooklyn 30), N.Y.

LONG, DALE HARRISON (Jun. '45), Instrumentman, C. M. St. P. & P. Ry., Milwaukee Depot (Res., 118 Seventh Ave., South West), Aberdeen, S. Dak.

LUM, WALTER BUNG SIN (Jun. '45), 2021 Cornell Rd., Cleveland 6, Ohio.

LUTTMAN-JOHNSON, JOHN DENISON MICHELL (Assoc. M. '45), Asst. Engr., Fay, Spofford & Thorndike, 11 Beacon St., Boston 8, Mass.

MEAD, FRANK FAY (M. '45), Civ. Engr. (P-5), Public Works Dept., U.S.N., Naval Operating Base, Terminal Island (Res., 357 Orizaba Ave., Long Beach 4), Calif.

MARTENET, OSCAR CONWAY (Jun. '45), Structural Draftsman, United Engrs. & Constructors, Inc., 1401 Arch St. (Res., 4421 Osage Ave.), Philadelphia 4, Pa.

MILLER, MAX JOSEPH (Assoc. M. '45), Asst. Engr. (Structural), U.S. Engr. Office, Room 541 Federal Bldg., Cincinnati 1, Ohio.

NAVIS, HERBERT ALBERT (Jun. '45), Ensign, CEC, U.S.N.R.; 88 Butler St., Forty Fort, Pa.

O'BRIEN, JOHN JOSEPH (Jun. '45), With U.S.N.; 9 Sycamore Drive, Great Neck, N.Y.

ORR, HERMAN (M. '45), Lt. Col., Corps of Engrs., U.S. Army, Headquarters, AFWESPAC-OCE, Army Post Office 707, Care, Postmaster, San Francisco, Calif.

PAISLEY, JOSEPH WILLIAM (Jun. '45), Asst. Promotion Mgr., *Power*, McGraw-Hill Pub. Co., 330 West 42d St., New York, N.Y. (Res., 545 Boulevard, Westfield, N.J.)

PULLIN, CHARLES RUSSELL (Jun. '45), Seaman 2/C, U.S.N.; 1602 Packer St., McKeesport, Pa.

RANKIN, ROBERT CRESWELL (Jun. '45), Authority for Expenditure-Estimator, St. L.S.W. Ry. Co., 418 North Spring St., Tyler, Tex.

RAY, MARVIN EVAN (Assoc. M. '45), City Engr., 712 Washington St. (Res., 2212 I St.), Vancouver, Wash.

SCHMOKER, ROBERT FREDERICK (Jun. '45), Ensign, CEC, U.S.N.R.; Route 1, Box 168A, Fullerton, Calif.

SCHULZ, JOHN DONALD (Jun. '45), Engr., Union Oil Co., Box 758, Wilmington, Calif.

SIEGEL, STANLEY THEODORE (Jun. '45), Ensign, CEC, U.S.N.R.; 5401 Ninth St., N.W., Washington, D.C.

SMITH, HAROLD IRVING (Assoc. M. '45), Asst. Civ. Engr., Dept. of Public Works, Box 551 (Res., Dutchess Turnpike, Route 3), Poughkeepsie, N.Y.

SOON, ALFRED CLEMENT (Jun. '45), 27 University St., West Lafayette, Ind.

SPEERS, WILLIAM EWING, JR. (Jun. '45), Ensign, CEC, U.S.N.R., 143d Naval Constr. Battalion, (ABCD), Care, Fleet Post Office, San Francisco, Calif.

STERN, JOHN LOUIS (Jun.), Ensign, CEC, U.S.N.R., Com. Ser. for Pacific Fleet, Care, Fleet Post Office, San Francisco, Calif.

SUTTON, STANLEY HUBERT (Jun. '45), Lt. (jg), CEC-V(S), U.S.N.R.; 323 West St. Joseph St., Lansing, Mich.

TOM, DAVID YUNG CHOY (Jun. '45), Research Graduate Asst. in Civ. Eng., Univ. of Illinois (Res., 704 South Gregory Pl.), Urbana, Ill.

TROTTER, ROY MARTIN (Assoc. M. '45), Asst. Engr., John S. Bates, Consultant Engr., 3134 Eton Ave. (Res., 1551 Sonoma Ave.), Berkeley 6, Calif.

TUCKER, WALTER LOWRIE, JR. (Jun. '45), Ensign, CEC, U.S.N.R.; Sandidges, Va.

VAN HORN, MAYNARD DUANE, JR. (Jun. '45), 415 Pennsylvania Court, Lexington 41, Ky.

VOLK, ROBERT NELSON (Jun. '45), Ensign, U.S.N.R.; 5726 Ira Ave., Cleveland, Ohio.

WAGNER, WALTER EDISON (Assoc. M. '45), Archt. and Engr., Bank of America Bldg., Fresno, Calif.

WELLER, LLOYD WAYNE (Jun. '45), Lt., U.S. Army, 1st O.T.C., O.S., Aberdeen Proving Ground, Md.

WILLIAMSON, JOHN ARTHUR (Jun. '45), Ensign, CEC, U.S.N.; 474 Sixty-first St., Oakland 9, Calif.

WOOLDRIDGE, ROY LISSEMORE (Jun. '45), Junior Engr., J. R. Worcester & Co., 79 Milk St., Boston (Res., 203 Fayette St., Wollaston), Mass.

MEMBERSHIP TRANSFERS

BARRON, JAMES LLOYD (Jun. '24; Assoc. M. '27; M. '45), San. Engr., National Biscuit Co., 449 West 14th St., New York (Res., 180 Hilton Ave., Hempstead), N.Y.

CAHOON, JAMES WAYNE (Jun. '35; Assoc. M. '45), Associate Engr., U.S. Bureau of Reclamation, Box 360, Salt Lake City 8, Utah.

CAMPBELL, WILLIAM WARD (Jun. '40; Assoc. M. '45), Lt. (jg), CEC, U.S.N.R., Naval Air Facility, Bldg. 104, Apt. A, Fairway Blvd., Columbus 9, Ohio.

CLOUDMAN, CHARLES GREENLEAF (Assoc. M. '39; M. '45), Valuation Engr., Ebasco Services, Inc., 2 Rector St., New York (Res., Towers Hotel, 25 Clark St., Brooklyn 2), N.Y.

DAVIES, SAMUEL LADD (Jun. '38; Assoc. M. '45), Maj., San. Corps, U.S. Army; 302 South El Paso, Russellville, Ark.

DOUCHA, JOHN CHARLES (Assoc. M. '28; M. '45), Gen. Mgr., J. A. Jones Constr. Co., Inc., Hotel Metropolitano, Quito, Ecuador.

FERNANDEZ-SANDOVAL, MIGUEL ANGEL (Jun. '37; Assoc. M. '45), Associate Engr. (Civ.), Antilles Div., U.S. Engr. Office, San Juan, Puerto Rico.

GREELY, JAMES WESTWOOD (Jun. '36; Assoc. M. '45), Lt. Comdr., U.S.N.R.; 195 Cliff Rd., Wellesley Hills, Mass.

HEAMAN, WILLIAM MCPHERSON (Jun. '35; Assoc. M. '45), Lt. Comdr., CEC, U.S.N.R., Quarters CB, Naval Training Station, Newport, R.I.

HUMMER, JOHN WILLIAM (Jun. '25; Assoc. M. '35; M. '45), Asst. Valuation Engr., The United Light and Power Service Co., 305 United Light Bldg., Davenport, Iowa.

KETTERING, CHARLES FRANKLIN (M. '37; Hon. M. '45), Vice-Pres. and Director, Gen. Motors Corp.; Pres. and Director, Gen. Motors Research Corp., Detroit 2, Mich. (Res., Ridgeleigh Terrace, Dayton, Ohio).

LAMBERT, HOWARD WILLIAM (Jun. '38; Assoc M. '45), Lt., CEC, U.S.N.R.; 424 Fourth Ave., Salt Lake City, Utah.

LONG, THOMAS AUBURN (Jun. '39; Assoc. M. '45), Civ. Engr., Municipal Eng. Div., The Panama Canal, Balboa Heights, Canal Zone. (Res., 946 South Madison Ave., Pasadena 5, Calif.)

MCCULLOUGH, STIRLING ENOCH (Assoc. M. '29; M. '45), Vice-Pres., Brown and Root, Inc., Box 3, Houston, Tex.

MILLS, JOHN PARDON, JR. (Jun. '37; Assoc. M. '45), Associate Traffic Statistician, State Dept. of Highways, Central Highway Bldg., Richmond 19, Va.

MOHL, EMANUEL ISRAEL (Jun. '33; Assoc. M. '45), Associate Engr. (Naval Archt.), Bureau of Ships, Navy Dept., 17th St. and Constitution Ave., Washington, D.C. (Res., 4G Laurel Hill Rd., Greenbelt, Md.)

PETERKA, ALVIN JOSEPH (Jun. '39; Assoc. M. '45), Associate Hydr. Engr., TVA, Hydr. Laboratory, Norris, Tenn.

PRATT, WILLIS GROVER (Jun. '35; Assoc. M. '45), Lt. (jg), CEC, U.S.N.R. (Res., 131 Monument St., Groton, Conn.)

RISSER, JAMES VAULX (Jun. '36; Assoc. M. '45), With Midwest Steel Works, Box 906 (Res., 2525 Lafayette), Lincoln 2, Nebr.

SELIM, MOHAMED AHMED (Jun. '39; Assoc. M; '45), Dr., Lecturer "A", Irrig. Dept., Faculty of Eng., Fouad First Univ., Giza, Egypt.

SHARRER, WILFRED HENRY (Jun. '35; Assoc. M. '45), Civ. Engr., Holmes, O'Brien & Gere, 204 East Jefferson St., Room 310 (Res., 240 Elk St.), Syracuse 5, N.Y.

SPODEN, HAROLD THIES (Jun. '41; Assoc. M; '45), Ensign, U.S.N.R., 3604 Richmond Blvd., Oakland, Calif.

STEPHENSON, HENSON KNOWLEN (Assoc. M. '44 M. '45), Associate Prof., and Research Engr. Structural Eng., Civ. Eng. Dept., Agri. and Mech. College of Texas, College Station, Tex.

SWANNACK, GEORGE ERNEST, JR. (Jun. '36; Assoc. M. '45), Col., Air Corps, U.S. Army; 1027 Frankland Ave., Walla Walla, Wash.

THOMAS, HUGUENIN, JR. (Jun. '30; Assoc. M. '39; M. '45), Lt. Col., Corps of Engrs., U.S. Army, U.S. Engr. Dept., Post Office Bldg., Savannah, Ga.

ZALKIND, GEORGE OSSIP (Assoc. M. '40; M. '45), Engr., Head of Crane Dept., Gibbs & Hill, Inc., Pennsylvania Station (Res., 226 West 70th St.), New York 23, N.Y.

REINSTATEMENTS

BEARSE, IRVING WOOD, Jun., reinstated Oct. 1, 1945.

CAMERON, DONALD EUGENE AMES, Assoc. M., reinstated Oct. 1, 1945.

CAMPBELL, EUGENE OLYN, Assoc. M., reinstated Nov. 1, 1945.

HECHMER, CARL ADAM, M., reinstated Oct. 1, 1945.

OAKES, IVAN EDWARD, M., reinstated Oct. 25, 1945.

RIDDLE, KARL, Assoc. M., reinstated Nov. 1, 1945.

THOMPSON, ZACHARIAH BUNDY, Assoc. M., reinstated Nov. 1, 1945.

WOODYARD, FRANK ALBERT, Assoc. M., reinstated Oct. 1, 1945.

TOTAL MEMBERSHIP AS OF NOVEMBER 9, 1945

Members	6,327
Associate Members	8,047
Corporate Members	14,374
Honorary Members	39
Juniors	6,529
Affiliates	77
Fellows	1
Total	21,020
(November 9, 1944	20,299)

Applications for Admission or Transfer

Condensed Records to Facilitate Comment from Members to Board of Direction

DECEMBER 1, 1945 NUMBER 12

The Constitution provides that the Board of Direction shall elect or reject all applicants for admission or for transfer. In order to determine justly the eligibility of each candidate, the Board must depend largely upon the membership for information.

Every Member is urged, therefore, to scan carefully the list of candidates published each month in CIVIL ENGINEERING *and to furnish the Board with data which may aid in determining the eligibility of any applicant.*

It is especially urged that a definite recommendation as to the proper grading be given in each case, inasmuch as the grading must be based upon the opinions of those who know the applicant personally as well as upon the nature and extent of his professional experience. Any facts derogatory to the personal character or professional reputation of an applicant should be promptly communicated to the Board.

Communications relating to applicants are considered strictly confidential.

The Board of Direction will not consider the applications herein contained from residents of North America until the expiration of 30 days, and from non-residents of North America until the expiration of 90 days from the date of this list.

MINIMUM REQUIREMENTS FOR ADMISSION

GRADE	GENERAL REQUIREMENT	AGE	LENGTH OF ACTIVE PRACTICE	RESPONSIBLE CHARGE OF WORK
Member	Qualified to design as well as to direct important work	35 years	12 years	5 years RCM*
Associate Member	Qualified to direct work	27 years	8 years	1 year RCA*
Junior	Qualified for subprofessional work	20 years	4 years	
Affiliate	Qualified by scientific acquirements or practical experience to co-operate with engineers	35 years	12 years	5 years RCM*

* In the following list RCA (responsible charge—Associate Member standard) denotes years of responsible charge of work as principal or subordinate, and RCM (responsible charge—Member standard) denotes years of responsible charge of IMPORTANT work, i.e., work of considerable magnitude or considerable complexity.

APPLYING FOR MEMBER

ANDRUS, LYNN THORPE (Assoc. M.), Ames, Iowa. (Age 52) (Claims RCA 12.7 RCM 8.6) May 1945 to date private practice as consultant; previously Bridge Designer and Architectural Engr., Iowa Highway Comm.; Control Chf. U.S. Engrs., Kansas City Dist., M.R.D.

ASHBRIDGE, WHITNEY (Assoc. M.), San Francisco, Calif. (Age 41) (Claims RCA 4.0 RCM 8.0) Sept. 1933–Aug. 1937 and Oct. 1940 to date with Corps of Engrs., U.S. Army, being 1st Lt., Capt., Major, and Lt. Col.; in the interim Structural Engr., Day & Zimmerman, Inc., Philadelphia, Pa.

BARRON, MAURICE, White Plains, N.Y. (Age 37) (Claims RCA 5.8 RCM 9.0) July 1945 to date Consultant, Office of scientific research and development, on loan to AAF as Operation Analyst; previously Superv. Designer, Office of Gilmore D. Clarke (Clarke, Rapuano & Holleran); with F. N. Severud, New York City; with Madigan-Hyland Co., Long Island City.

BOBLOW, REUBEN (Assoc. M.), Rio de Janeiro, Brazil. (Age 44) (Claims RCA 6.0 RCM 10.9) Sept. 1944 to date Bridge Engr., Companhia Vale do Rio Doce, Rio de Janeiro, Brazil; previously Bridge Engr., Parsons, Klapp, Brinckerhoff & Douglas, New York City; Structural Engr., Caribbean Archt.-Engr., New York City; Bridge Engr., Robinson & Steinman, Cons. Engr., New York City.

BROUK, OTTO (Assoc. M.), Cicero, Ill. (Age 38) (Claims RCA 5.8 RCM 8.5) Aug. 1940 to Aug. 1945 Chf. Structural Engr., Contrs., Pacific Naval Air Bases, Honolulu, Hawaii.

BUXTON, JOHN ELLIS, Abilene, Tex. (Age 53) (Claims RCA 1.3 RCM 20.1) June 1942 to date Post Engr., 8th Service Command; previously private practice, Little Rock, Ark.; Dist. Maintenance Engr. and State Maintenance Engr., Arkansas Highway Comm.

CARRIERE, JEAN PAUL, Ottawa, Canada. (Age 38) (Claims RCA 5.5 RCM 7.0) Oct. 1945 to date Engr., Grade 1, Head Office, Public Works of Canada; previously with Royal Canadian Engrs.

CARSON, WARREN PAUL, Gilbertsville, Ky. (Age 42) (Claims RCA 2.4 RCM 6.5) Jan. 1936 to date with TVA, since Jan. 1942 as Office Engr.

COHEN, SAMUEL, New York City. (Age 55) (Claims RCA 2.0 RCM 22.8) Feb. 1916 to date with City of New York, since Feb. 1942 as Civ. Engr. charge of Welding Div., Dept. of Housing and Buildings.

COOK, RICHARD WALLACE, Oak Ridge, Tenn. (Age 38) (Claims RCA 1.2 RCM 8.9) Nov. 1940 to date with U.S. Army, at present as Lt. Col., Corps of Engrs., since Oct. 1944 being Operations Officer.

CRENSHAW, CARLTON, APO 667, care Postmaster, New York City. (Age 40) (Claims RCA 3.5 RCM 12.3) June 1942 to date Major, Corps of Engrs. (overseas); previously Mech. Designer, Tennessee Copper Co.; with TVA.

CROWTHER, JAMES IRVING (Assoc. M.), Baltimore, Md. (Age 36) (Claims RCA 2.0 RCM 5.2) March 1941 to date with Corps of Engrs., U.S. Army, at present as Lt. Col.; previously Staff Engr., Comm. on Governmental Efficiency and Economy, Baltimore, Md.

DOUGHERTY, EDWARD A., Cleveland, Ohio. (Age 58) (Claims RCM 26.3) Oct. 1917 to date with New York Central R.R., since May 1943 as Asst. Gen. Mgr.

GEARHART, RALPH WARREN, Cedar Rapids, Iowa. (Age 56) (Claims RCM 31.6) Jan. 1929 to July 1942 and Sept. 1945 to date in private practice; in the interim writing specifications for Rock Island (Ill.) Arsenal for U.S. Engrs.: Supt. in charge of maintenance at Shreveport, La., Holding and Reconsignment Point; with Chas. M. deLeuw Co., McAlester, Okla.

HERBERT, WILLIAM SEARS, Ann Arbor, Mich. (Age 42) (Claims RCA 5.4 RCM 6.5) June 1936 to date with Shoecraft, Drury & McNamee, Engrs.; since June 1943 as Senior Asst. Engr.

HULL, NOAH ELDER, McGregor, Tex. (Age 48) (Claims RCM 20.1) April 1942 to date Chf. Engr., Bluebonnet Ordnance Plant, McGregor, Tex.; previously Works Engr., The Firth Carpet Co., Firthcliffe, N.Y.

IVES, HOWARD SMITH, Niantic, Conn. (Age 45) (Claims RCA 3.4 RCM 11.9) Sept. 1945 to date Project Engr., Connecticut River Bridge, Old Lime to Saybrook; Dec. 1940 to Sept. 1945 Lt. Col., Corps of Engrs., U.S. Army, Base Engr. SW-P-A; previously with Connecticut Highway Dept.

JACKSON, J. CEYLON, Babylon, N.Y. (Age 57) (Claims RCA 13.2 RCM 14.2) Jan. 1930 to date with New York State Dept. of Public Works, since June 1942 as Senior Civ. Engr.

JIMENEZ-LOPEZ, JORGE JAIME (Assoc. M.) APO San Francisco (Age 37) (Claims RCA 4.1 RCM 5.0) Dec. 1940 to date with QM Div., U.S. Army, at present as Lt. Col.; previously Assistant Director of Operation for WPA in Puerto Rico.

JOHNSON, CECIL WILLIAM (Assoc. M.), Bremerton, Wash. (Age 38) (Claims RCA 3.0 RCM 5.5) 1940 to date with Public Works Div., Puget Sound Navy Yard, Bremerton, Wash., at present as Senior Civ. Engr. (P-5); previously with U.S. Bureau of Reclamation.

KENNY, JAMES STEPHEN, Belle Harbor, N.Y. (Age 41) (Claims RCA 3.9 RCM 9.0) 1926 to Dec. 1940 and Sept. 1945 to date with City of New York, at present as Civ. Engr., Dept. of Marine and Aviation, at La Guardia Field; in the interim with CEC, U.S. Navy, as Lt., Lt. Commdr., and Commdr.

LINCOLN, ROBERT ALEXANDER, Great Neck, N.Y. (Age 38) (Claims RCA 1.7 RCM 15.5) July 1941 to date commissioned officer, Corps. of Engrs., U.S. Army, 175th Engr. Regt. (GS); previously Asst. Engr. with Carl H. Watson, Civ. Engr., Great Neck, N.Y.

LORD, KENNETH THOMAS, San Juan, Puerto Rico. (Age 37) (Claims RCA 3.9 RCM 5.1) Aug. 1935 to date with U.S. Engr. Dept., since March 1941 as Asst. Engr., Associate Engr. and Engr., Puerto Rico Dist. & Division Office.

MCATEE, LOUIS ALPHONSUS, San Francisco, Calif. (Age 58) (Claims RCA 13.6 RCM 15.9) Aug. 1913 to date with City of San Francisco, since April 1939 being Constr. Engr., City Water Dept.

MIMS, HARRY MCCULLOUGH, Reevesville, S.C. (Age 39) (Claims RCA 10.1 RCM 7.2) Jan. 1942 to date with CEC, USNR as Lieut. and (since Jan., 1944) Lieut. Commdr., at present being Asst. Dist. Public Works Officer, 6th Naval Dist.; previously Res. Engr. (Senior), South Carolina Highway Dept.

MULLIN, JEROME ALEXANDER, Tenafly, N.J. (Age 54) (Claims RCA 10.0 RCM 28.0) March 1910 to date with Raymond Concrete Pile Co., at present as Designing Engr.

NELSON, FRED BURGESS (Assoc. M.), New York City. (Age 70) (Claims RCA 1.8 RCM 37.6) Oct. 1909 to date with New York City Dept. of Water Supply, Gas & Elec., since April 1943 Acting Borough Engr. in charge of Manhattan Div. and System.

PUGH, NORMAN JOHN, Coventry, England. (Age 43) (Claims RCA 7.5 RCM 9.5) 1938 to date Water Engr. and Mgr. to Corporation of City of Coventry.

REEVE, WILLIAM ALEXANDER, Trenton, N.J. (Age 58) (Claims RC 16.0 D 12.0) 1931 to date Senior Engr., Bridge Div., John A. Roebling's Sons Co., Trenton, N.J.

RICHARDSON, EDWARD CHARLES, Rolla, Mo. (Age 46) (Claims RCA 8.3 RCM 8.4) Sept. 1944 to date Prof. of Military Science and Tactics, Missouri School of Mines and Metallurgy; previously Instructor in Mil. Eng., and (1 year) officer in charge of ROTC activities, Univ. of Nebraska; Asst. Mgr., Nebraska Statewide Planning Survey, Nebraska Highway System.

RUTTER, EDWARD JACKSON (Assoc. M.), Knoxville, Tenn. (Age 44) (Claims RCA 9.8 RCM 8.7) July 1934 to date with TVA, since April 1940 as Senior Hydr. Engr.

SANDSTEDT, CARL EDWARD (Assoc. M.), College Station, Tex. (Age 59) (Claims RCA 16.4 RCM 17.2) Sept. 1923 to date with Agricultural & Mechanical Coll. of Texas, since Sept. 1937 as Prof. of Civ. Eng., since July 1943 also Acting Head of Dept.

SCHROEPFER, GEORGE JOHN (Assoc. M.), Minneapolis, Minn. (Age 39) (Claims RCM 9.9) June 1943 to Sept. 1945 Lecturer, and Sept. 1945 to date Prof. of San. Eng., Univ. of Minnesota; Jan. 1936 to date Asst. Chf. Engr., Chf. Engr., and Supt., St. Paul San. Dist.

STEMWELL, WILLIAM IGNATIUS, San Francisco, Calif. (Age 45) (Claims RCA 3.1 RCM 10.9) Feb. 1941 to Oct. 1945 with CEC, Bureau of

Yards & Docks, U.S. Navy; previously As- control in war areas; previously Field Engr. Ammunition Supply Depot; with U.S. PRA

Yards & Docks, U.S. Navy; previously Associate Civ. Engr., TVA.

TOMMERUP, CARL CHRISTIAN HANSEN (Assoc. M.), Seattle, Wash. (Age 44) (Claims RCA 9.8 RCM 9.1) Nov. 1944 to date Chf. Structural Engr. for John Graham, Archts. & Engrs., Seattle, Wash.; previously Superv. Engr., Arthur G. McKee & Co.

TOWSLEY, IRVING SIDNEY (Assoc. M.), Philadelphia, Pa. (Age 52) (Claims RCA 6.7 RCM 17.6) Feb. 1935 to date Cons. Engr., Philadelphia.

VANCE, JAMES ALFRED, Woodstock, Ont., Canada (Age 53) (Claims RCA 11.0 RCM 20.0) 1914 to date with W. G. Ure, Cons. Engr.

WANKMULLER, JACOB WILLIAM THOMAS (Jun.), Williamsburg, Va. (Age 35) (Claims RCA 3.4 RCM 6.3) May 1942 to date with FWA, War Public Works and Bureau of Community Facilities, since July 1944 as Superv. Engr.; previously Asst. San. Engr., New York City Dept. of Health, San. Bureau.

WHITLOCK, HAROLD JOHN (Assoc. M.), Sacramento, Calif. (Age 52) (Claims RCA 12.8 RCM 8.1) Nov. 1942 to date Lieut. Comdr. and Comdr., USNR, being Design Supt., Public Works Div., U.S. Navy Yard, Mare Island, Calif.; previously Associate Engr., and Senior Engr., California Div. of Highways Bridge and Maintenance Depts.

WOLPERT, OTTO (Assoc. M.), Detroit, Mich. (Age 61) (Claims RCA 18.0 RCM 15.0) 1942 to date as Senior Engr., Works Eng. Dept., Fisher Body Div., Gen. Motors, Detroit, Mich.; previously Engr. Coordinator and Executive, Gahagan Constr. Corporation.

WRIGHT, FRANK WALDEN, Hamden, Conn. (Age 61) (Claims RCA 7.1 RCM 27.1) Oct. 1921 to date Town Engr., Hamden, Conn.

YATES, ROBERT RALEIGH, Brooklyn, N.Y. (Age 59) (Claims RCA 3.0 RCM 31.5) 1918 to date with CEC, U.S. Navy, at present as Capt.

ZAMPELLA, ALBERT ANDREW (Assoc. M.), Paterson, N.J. (Age 38) March 1941 to date with U.S. Army, at present as Major, being Chf., Management Branch and Executive Officer of Air Installations (Engr.) Division, First Air Force; previously Engr., Passaic County Engr. Dept.

APPLYING FOR ASSOCIATE MEMBER

AVERY, EDWARD FREDERICK, Mill Valley, Calif. (Age 36) (Claims RCA 4.3 RCM 3.7) June 1944 to date Mech. Engr. (CS Class P5) and Contr. Officer's Representative, San Francisco Ordnance Dist., War Dept., U.S. Army; previously member of firm, Engrs. Associated; Senior Draftsman, Walsh Kaiser, Inc.; Superv. Engr., Defense Plant Corporation, U.S. Govt., Washington, D.C.; Coordinating Engr., L. E. Dixon Co., Contrs., San Luis Obispo, Calif.

BACON, MAURICE WARDER, New York City. (Age 30) (Claims RCA 3.3 RCM 2.1) May 1942 to date with Ford, Bacon & Davis, Inc., since Aug. 1943 as Archt. Engr. and Asst. to Engr. on construction of dams, etc.; previously Archt., Shaw, Naess & Murphy, New York City, Archts. for Bermuda Army Base and Airfield; Marine Draftsman, Hopeman Bros., New York City.

BENNETT, NEWCOMB BENJAMIN, JR., Hyattsville, Md. (Age 35) (Claims RCA 8.9 RCM 1.0) April 1942 to date with Bureau of Reclamation, U. S. Dept. of Interior, in various capacities, since July 1945 being Engr. (P-6); previously Asst. State Engr., Wyoming.

BIEVER, CARL ARTHUR, Rolla, Mo. (Age 37) (Claims RCA 7.7 RCM 1.5) May 1941 to date Topographic Engr. P-2, U.S. Geological Survey; previously with U.S. Indian Irrigation Service.

BORG, JOSEPH ELMER (Junior), Des Moines, Iowa. (Age 29) (Claims RCA 3.3 RCM 1.2) April 1942 to date, 1st Lt. and Capt., Corps of Engrs., U.S. Army, being Asst. Post Engr., Ft. Myer, Va.; previously Structural Engr., Process Industries Dept., Blaw-Knox Co., Blawnox, Pa.; Asst. Structural Engr., Office of QM Gen., Design Sec., Constr. Div., War Dept., Washington, D.C.; Asst. Prof. of Structural Eng., Fenn Coll., Cleveland, Ohio.

BORLAND, VICTOR JAMES, Los Angeles, Calif. (Age 58) (Claims RCA 34.8) 1925 to date Asst. Engr. and Engr., Chf. Draftsman, Los Angeles County San. Dists.

BOW, WILSON FRANCIS (Junior), Seattle, Wash. (Age 32) (Claims RCA 4.7 RCM 1.6) Sept. 1941 to date Dist. Public Health Engr., Washington State Dept. of Health, Seattle; previously San. Engr., Whatcom County, Wash.

BRIGHT, JOHN HARVEY, Jackson, Miss. (Age 35) (Claims RCA 10.2) Aug. 1941 to date with U.S. Public Health Service, as Capt., and since Jan. 1945 Major, being State Director of Malaria control in war areas; previously Field Engr., Texas Highway Dept.; Engr. Inspector, PWA.

BRUNN, SIG RICHARD, Kansas City, Mo. (Age 32) (Claims RCA 1.4 RCM 6.9) March 1941 to date with TWA, in various capacities, since March 1945 being Systems Supervisor of Constr.; previously Contr., member of firm, Brunn Constr. Co.

BUEHL, WESLEY ANDREW, Oakland, Calif. (Age 34) (Claims RCA 5.4 RCM 1.1) March 1942 to Feb. 1944 Designing Engr., and Aug. 1945 to date Civ. Engr., Donald R. Warren Co., San Francisco, Calif.; in the interim Designing Engr., Kaiser Co., Inc., Iron & Steel Div.; previously Civ. Engr., with Brown Constr. Co. with Schweizer Dipple Co.; with Hunkin-Conkey Constr. Co., Asst. Engr., Cleveland Planning Office, Ohio Dept. of Highways.

BYRNE, RALPH EDWARD, JR. (Junior), Rockford, Ill. (Age 34) (Claims RCA 3.0 RCM 3.6) Sept. 1944 to Aug. 1945 (part of time) and Aug. 1945 to date Mathematical Consultant, Bartelt Eng. Service, Rockford, Ill.; previously Math. Physicist, Barber-Coleman Co., Rockford; Instructor in Math., Univ. of California, Los Angeles; Chf. Inspector, Dames & Moore, Soil Consultants, Los Angeles.

CLINE, JAMES ALBERT, Omaha, Nebr. (Age 44) (Claims RCA 3.7 RCM 0.5) Nov. 1933 to Dec. 1937 and March 1938 to date with U.S. Engr. Dept., and since Sept. 1945 as Engr. (Constr.) at Omaha; in the interim, Engr., Middle Loup Public Power & Irrigation Dist., Arcadia, Nebr.

CONWELL, JAMES ALEXANDER (Junior), Knoxville, Tenn. (Age 34) (Claims RCA 5.0) Sept. 1942 to date, Corps. of Engrs., U.S. Army, finally as Capt.; previously Asst. Civ. Engr. and Associate Civ. Engr., Special Eng. Div., The Panama Canal.

DAVIDSON, WILLIAM EDWARD (Junior), Davisville, R.I. (Age 34) (Claims RCA 4.6 RCM 2.7) Nov. 1940 to date with U.S. Navy, since Aug. 1945 as Comdr., being Executive Officer, Naval Constr. Training Center, Davisville, R.I.

DE MONTIS, MARIANO ENRIQUE, Managua, Nicaragua. (Age 36) (Claims RCA 5.6) Nov. 1935 to date with U.S. PRA, since July 1942 as Highway Engr., being Chf. of Location and Drafting Sec. for cooperative highway work in Nicaragua.

DERSHIMER, JOHN EDWARD, New York, N.Y. (Age 30) (Claims RCA 4.5 RCM 2.9) Dec. 1940 to date with Corps of Engrs., U.S. Army, since Oct. 1943 as major.

DIDRENCE, JOSEPH JAY, Mobile, Ala. (Age 36) (Claims RCA 2.1) March 1942 to date with War Dept., since June 1942 as Civ. Engr., Mobile, Ala.; previously Land Engr., Dade Commonwealth Title Co., Miami, Fla.

ELLETT, EMERSON SKINNER, Silver Spring, Md. (Age 34) (Claims RCA 4.7) June 1943 to date Engr., Applied Physics Laboratory, The Johns Hopkins Univ.; previously Senior Engr., Greeley & Hansen, Chicago, Ill.; with U.S. Bureau of Reclamation, Denver.

EPSTEIN, JOSEPH LOUIS, Brooklyn, N.Y. (Age 38) (Claims RCA 13.7) Oct. 1935 to date Asst. Civ. Engr., Dept. of Public Works, New York City, acting as Office and Field Engr., Asst. Geologist and Office Engr.

FARRAR, JAMES MONTGOMERY, New York City. (Age 43) (Claims RCA 8.8 RCM 8.7) Dec. 1940 to Sept. 1945 with various Air Service Commands, Dayton, Ohio, AAF, at present returned to inactive status as Lt. Col.

FOLEY, WILLIAM EDWARD, Stratford, N.J. (Age 38) (Claims RCA 5.8 RCM 6.2) Feb. 1942 to date Senior Draftsman, New York Shipbuilding Corporation, Camden, N.J.; previously Structural Engr., Zone Constr. QMC, Baltimore, Md.; Structural Engr., PBA, Washington, D.C.

FROST, ROBERT EDSON (Junior), Lafayette, Ind. (Age 29) (Claims RCA 2.4) Feb. 1940 to date with Joint Highway Research Project, Purdue Univ., being Graduate Asst., Research Asst. and (since Aug. 1943) Research Engr.

GRAVES, CHARLES LEONIDAS (Junior), Port Arthur, Tex. (Age 29) (Claims RCA 4.5 RCM 0.6) March 1941 to date with E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., on work for U.S. Govt.; previously Asst. Res. Engr., Modjeski & Masters, Cons. Engrs., Harrisburg, Pa.; Jun. Engr., Illinois Div. of Highways, Springfield, Ill.

HARRIS, RICHARD JOHN (Junior), Belleville, N.J. (Age 34) (Claims RCA 9.0 RCM 0.5) Nov. 1933 to Nov. 1935 2d Lieut., and May 1942 to date Lt., Corps of Engrs., U.S. Army; in the interim Jun. Naval Archt., being Prin. Eng. Draftsman, Design Sec., Industrial Dept., Navy Yard, Philadelphia, Pa.; with Metropolitan Life Insurance Co., Parkchester Housing Project.

HEWES, JOHN ALDEN, Portland, Ore. (Age 40) (Claims RCA 9.8 RCM 2.9) May 1945 to date Civ. Engr. (P-3), U.S. Army Engrs.; Civ. Engr. (P-3) War Dept. 9th Service Command, Portland Sub-Port of Embarkation & Beaver Ammunition Supply Depot; with U.S. PRA, finally as Associate Highway Engr.

HOPKINS, LEONARD OTIS, JR. (Junior), Montgomery, Ala. (Age 34) (Claims RCA 2.5) Dec. 1944 to date associated with W. A. McWaters, Contr., Montgomery, Ala.; previously Tech. Aide to Tech. Supervisor, Process Dept., Tennessee Eastman Corporation, Oak Ridge, Tenn.; with TVA, Constr. Plant Div.

HOPWOOD, ROBERT HENRY, Milwaukee, Wis. (Age 38) (Claims RCA 6.0 RCM 3.0) 1934 to date with Charles S. Whitney, Cons. Engr., Milwaukee, Wis.

HOUZE, GERALD LUCIAN, Pittsburgh, Pa. (Age 42) (Claims RCA 3.9) Jan. 1926 to date with Pittsburgh-Des Moines Steel Co., since Jan. 1945 as Design Engr.

HURLEY, ELMER ERNEST, Camden, Ark. (Age 37) (Claims RCA 9.3) July 1927 to date (except at short intervals) with Arkansas Highway Dept.

JENNINGS, CHARLES HAROLD, St. Louis, Mo. (Age 41) (Claims RCA 8.4 RCM 4.0) 1925 to date Hydr. Engr., U.S. Corps of Engrs., since June 1945 assisting Regional Head, Transmission & Constr. Sec., Design & Transmission Div., REA.

JOHNSON, ROBERT E. LEE, Houston, Tex. (Age 33) (Claims RCA 5.3 RCM 2.3) Aug. 1943 to date Designing Engr., Utilities Dept., Houston; previously Asst. Engr., U.S. Engrs. War Corps; with City Eng. Dept., Houston.

KLOSS, HANS, Detroit, Mich. (Age 40) (Claims RCA 8.4 RCM 5.9) Oct. 1944 to date Structural Engr. and Designer, Great Lakes Steel Corporation, Stran Steel Div.; previously Project Engr., Gen. Motors, Fisher Body Div., Aircraft Development Sec.; Structural Engr. and Designer, Giffels & Vallet, Inc., Archts. and Engrs., Detroit, Mich.; Designer for steel construction, Globe Iron Constr. Co., Norfolk, Va.

LARKIN, FRANKLIN JONATHAN (Junior), Pittsburgh, Pa. (Age 34) (Claims RCA 8.7) July 1934 to July 1942 and Oct. 1945 to date with Dravo Contr. Co., Neville Island, Pittsburgh, Pa., at present as Engr. Supt.; in the interim with Corps of Engrs., U.S. Army, as Lt., and Capt.

LOVEJOY, RICHARD FIEBIG (Junior), Oakland, Calif. (Age 34) (Claims RCA 1.3 RCM 2.9) Jan. 1943 to date Lt., 63rd U. S. Naval Constr. Bn., Southwest Pacific, being Transportation Officer; previously Field Engr., Utah Constr. Co., Kingman, Ariz. on Davis Dam; Asst. Engr., U.S. Engrs. in Hawaii, being Project Engr.; Jun. Engr., Constr. Dept., East Bay Municipal Utility Dist., Oakland, Calif.

LOWRANCE, FRANK EMANUEL (Junior), San Bruno, Calif. (Age 34) (Claims RCA 8.8) Jan. 1942 to date with U.S. Navy, being Asst. Structural Engr., Asst. Public Works Officer and Public Works Officer; previously with U.S. Dept. of Interior, until Feb. 1939 as Chf. of Party.

LUCAS, GEORGE MICHAEL COHAN, Bradenton, Fla. (Age 41) (Claims RCA 7.2) Feb. 1945 to date Bituminous Engr., Nostrip Div., Southeastern Div., Maguire Industries, New York City; previously Capt., U.S. Army Engrs.; Project Engr., Hillyer & Lovan, Jacksonville, Fla.; Constr. Engr., Smith, Yetter & Griffin, Palm Beach, Fla.; Water Engr., Pleasantville (N.Y.) Constrs.

MEEM, STEPHEN HALSEY, JR., Staunton, Va. (Age 35) (Claims RCA 5.3 RCM 0.3) Jan. 1942 to Sept. 1945 with Field Artillery, U.S. Army, as Lieut., and since Feb. 1944 Major; previously Area Engr., Bldg. Engr. and Layout Engr. for Constr. Div., E. I. Du Pont Co.

MOORE, EMMETT BURRIS, Pullman, Wash. (Age 44) (Claims RCA 7.8 RCM 2.4) Sept. 1929 to date with Civ. Eng. Dept., State Coll. of Washington, since July 1945 as Prof.; Associate, Office of Pres. of Coll. of Eng.

NORTON, HAROLD RUSSELL, Chicago, Ill. (Age 33) (Claims RCA 2.2) June 1942 to date with AAF, Air Tech. Service Command, since June 1943 as Dist. Constr. Engr.; previously with Minnesota Dept. of Public Works.

ONDERDONK, ARTHUR BRUCE JOSEPH (Junior), East Hartford, Conn. (Age 31) (Claims RCA 4.0 RCM 1.0) Sept. 1941 to date with USNR, since Sept. 1942 with CEC, at present as Lieut.; previously First Asst. Engr. with F. P. Close, Civ. and Cons. Engr., Hartford.

ORRIN, ROBERT CARLTON (Junior), Lenoir City, Tenn. (Age 27) (Claims RCA 4.0) Dec. 1940 to date with TVA, since July 1944 as Chf. of Party in charge of an Eng. Unit.

PATON, WILLIAM, Terre Haute, Ind. (Age 37) (Claims RCA 6.8 RCM 0.3) Sept. 1945 to date Sales Engr., Armco Drainage & Metal Products, Inc.; previously with E. I. du Pont de Nemours & Co.; with State Highway Comm. of Indiana; with California Highway Comm.

RIGSBEE, HERBERT KENNETH (Junior), Austin, Tex. (Age 35) (Claims RCA 5.9 RCM 1.1) July 1940 to Dec. 1941 and Dec. 1944 to date with Texas Highway Dept., at present as

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Jun. Bridge Design Engr.; in the interim Field Engr., Brown Shipbuilding Corporation, Houston, Tex.; with TVA.

ROBIN, SIDNEY (Junior), Philadelphia, Pa. (Age 28) (Claims RCA 3.6) Oct. 1945 to date Designer and Draftsman, Du Pont de Nemours & Co., Wilmington, Del.; previously Chf. Draftsman and Asst. Group Leader, Kaiser Cargo, Inc., Fleetwings Div., Bristol, Pa.; with Brewster Aero Corporation, Johnsville, Pa.; with Ford, Bacon & Davis, Inc., Engrs., Pottstown, Pa.; Bldr., Philadelphia.

ROMIG, WILLIAM DAVIS (Junior), Washington, D.C. (Age 31) (Claims RCA 3.0 RCM 1.9) May 1941 to date with Branch of Project Planning, Bureau of Reclamation, since July 1945 as Engr., P-4; previously Jun. Hydr. Engr., Colorado Water Conservation Board, Denver, Colo.

RUPPERT, EDWIN LEITH, Seattle, Wash. (Age 30) (Claims RCA 2.0) July 1945 to date Head, Environmental San. Eng. Sec., Div. of Public Health Eng., Washington State Dept. of Health; previously with U.S. Public Health Service; Asst. to Planning Engr., Maryland-National Capital Park & Planning Comm., Silver Spring, Md.

RUSH, VICTOR ANTHONY, New York City (Age 34) (Claims RCA 5.4 RCM 2.6) April 1942 to date Concrete Designer, M. W. Kellogg Co., New York City; previously with Structural Engr. TVA; Jun. Engr., Detached Design Unit, Dept. of Sewers and Highways (BPM); Jun. Engr., Detached Design Unit, Board of Education.

ST. MALO, ALBERTO DE (Junior), Panama, Panama. (Age 35) (Claims RCA 5.5 RCM 2.3) May 1939 to date Prof. of Civ. Eng., and since 1943 Dean, School of Eng., Inter-American Univ.; also Dec. 1944 to date Secy.-Treas., St. Malo-Arias, S.A., with Ministry of Public Works, Panama Govt.; Associate Engr., Dept. of Eng.

SCHOLER, WALTER, JR. (Junior), Lafayette, Ind. (Age 30) (Claims RCA 2.0 RCM 2.2) June 1937 to June 1941 Structural Engr. with Walter Scholer, Archt. and Sept. 1945 to date member of firm, Walter Scholer & Associates, being Archt. and Structural Engr.; in the interim Army Officer.

SHEWBRIDGE, WELLFORD HOPE, Richmond, Va. (Age 41) (Claims RCA 9.4) Dec. 1934 to date Asst. Engr., Bureau of San. Eng., Virginia Dept. of Health.

SMITH, ALBERT GORDON, FPO, San Francisco, Calif. (Age 36) (Claims RCA 5.6 RCM 4.3) Sept. 1942 to date with U.S. Navy, since Jan. 1945 as Executive Officer, Constr. Bn., previously with TVA finally as Associate Civ. Engr.

SPEARS, RALPH WESTLY (Junior), Mission, Kans. (Age 34) (Claims RCA 3.1 May 1938 to date with U.S. Engr. Office, Kansas City, Mo., since Nov. 1942 being Asst. to Associate Engr.)

STALLWORTH, THOMAS WILLIAM (Junior), Care, Postmaster, New York City. (Age 34) (Claims RCA 3.9) Aug. 1942 to date with U.S. Army, at present as Capt., since June 1945 being Ground Safety Officer for European Div., ATC; previously graduate student Univ. of Texas; Office Engr., Maintenance Div., Texas Highway Dept.

WILLIAMS, RAYMOND NORMAN, Durban, South Africa. (Age 36) (Claims RCA 12.3) 1940 to date with 7th Field Co., SAEC, UDF, 1941 transferred to UK Forces, and at present Garrison Engr. and D/CRE, India Command.

WONG, HSU-SUN, Chicago, Ill. (Age 32) (Claims RCA 3.5) Feb. 1945 to date Trainee, Bridge Engr.'s Office, Chicago, Burlington & Quincy R.R.; previously with Office of Bridge Engrs., Ministry of Communications, China, finally as Associate Engr.

ZEHNER, JOHN RANDALL, Nyack, N.Y. (Age 40) (Claims RCA 4.8) June 1926–March 1933 and Feb. 1941 to date with Turner Constr. Co., being Jun. Engr. and Asst. Supt., and (since Feb. 1941) Purchasing Agent; in the interim, Constr. Supt., Montgomery Ward & Co.

APPLYING FOR JUNIOR

COHEN, EDWARD, New York City. (Age 24) 1944 to date student; previously Asst. Engr., Eng. Dept., East Hartford, Conn.; Field Engr., Bartlett-Brainard Co., Hartford, Conn.; Jun. Eng. Aide, Connecticut Highway Dept.; Transitman, Cauldwell-Windgate Co., New York City.

COHEN, WILLIAM MARTIN, New York City. (Age 27) May 1942 to date Lt., Corps of Engrs., U.S. Army; previously with U.S. Engrs., at Huntington, W.Va., and Baltimore, Md.; Jun. Engr., Dept. of Water Supply, New York City; Asst. Draftsman, Dept. of Commerce, Washington, D.C.

HUTCHINSON, ALEXANDER PAUL, Pittsburgh 21, Pa. (Age 23) Nov. 1944 to date Chf. Draftsman with Alex. Hutchinson, Wilkinsburg, Pa.; previously Draftsman, Union R.R., Pittsburgh, Pa.

LO, JOHN PENCHANG, Pittsburgh, Pa. (Age 29) July 1945 to date training in practical engineering, Morris Knowles, Inc., Engrs., Pittsburgh, Pa.; previously Tech. Expert and Chf. San. Engr., Yunnan (China) Provincial Health Administration, Tech. Expert and Head of Dept. of Anti-malaria Eng., Yunnan Provincial Anti-malaria Comm., Yunnan, China.

MCDANIEL, SILAS WINFIELD, Tacoma, Wash. (Age 28) (Claims RCA 3.2) May 1942 to date Computer, Field Draftsman and finally Officer Engr., 2d Nisqually Power Development, Tacoma City (Wash.) Light Dept.; previously with Washington Toll Bridge Authority.

NEEDHAM, CLYDE ALDEN, Knoxville, Tenn. (Age 29) (Claims RCA 1.5) June 1941 to date with Corps of Engrs., U.S. Army, in various capacities, at present as Capt.

ROSSO, ROBERT NEIL, JR., East Lansing, Mich. (Age 23) July 1945 to date Engr., The Christman Co., Lansing, Mich.; previously Structural Detailer, American Bridge Co., Gary, Ind.

WOHLT, PAUL EDWARD, Omaha, Neb. (Age 32) May 1945 to date Engr. (Soil Mechanics) P-3, U.S. Engr. Office, Omaha Dist.; previously with Soil Mechanics, Missouri River Div., War Dept.

1941 GRADUATE

CASE SCHOOL OF APPLIED SCI.
(B.S. in C.E.)

	AGE
KATZ, IRWIN CHARLES	(26)

1943 GRADUATES

MONTANA STATE COLL.
(B.S.)

JACOBSON, MARTIN (24)

UTAH STATE AGRI. COLL.
(B.S. in C.E.)

BENTON, DAVID EUGENE (24)

1944 GRADUATES

COLO. STATE COLL.
(B.S. in C.E.)

GATES, ALLEN CLAIR (22)
LESLIE, LLOYD OWEN (24)

MANHATTAN COLL.
(B.C.E.)

NALLY, RICHARD EUGENE (22)
SECCHIA, FRANK FELIX (22)

N.C. STATE COLL.
(B.C.E.)

BARNES, FLOYD POWELL (22)

1945 GRADUATES

UNIV. OF CALIF.
(B.S.C.E.)

PERSON, WAYNE HIRAM (24)

ILL. INST. OF TECH.
(B.S. in C.E.)

GOURLEY, REX RAMON (20)

IOWA STATE COLL.
(B.S.C.E.)

MURRAY, ROBERT WESLEY (20)

UNIV. OF LOUISVILLE
(B.C.E.)

COADY, LOUIS DEPPEN, JR. (21)
CORRIN, RALPH JAMES (21)
WELCH, MARION CARLYLE (24)

MANHATTAN COLL.
(B.C.E.)

PASQUARELLI, JEROME PETER (27)

COLL. OF CITY OF N.Y.
(B.C.E.)

ALEXANDER, STUART MURRAY (20)
LEVINE, LAWRENCE (22)

PA. STATE COLL.
(B.S. in C.E.)

MATREJEK, EDMUND WALTER (21)

UNIV. OF S.C.
(B.S. in C.E.)

POSTAL, GUS WILLIAM (20)

TUFTS COLL.
(B.S.)

CATALDO, JOHN ALBERT (20)
PRESTON, DAVID BEMIS (20)

UNIV. OF VA.
(B.C.E.)

COLEMAN, GEORGE WHITNEY (20)

YALE UNIV.
(B.S. in C.E.)

GOODPASTURE, ROBERT CARROL (20)

The Board of Direction will consider the applications in this list not less than thirty days after the date of issue.

RECENT BOOKS

New books donated by the publishers and filed in the Engineering Societies Library, or in the Society's Reading Room. Notes regarding books are taken from the books themselves, edited by the staff of the Society or of the Library. Books in the Library may be borrowed by mail by Society members for a small handling charge.

BUILDING CONSTRUCTION ESTIMATING. By G. H. Cooper. McGraw-Hill Book Co., New York and London, 1945. 282 pp., illus., diagrs., charts, tables, $9^1/_4 \times 6$ in., cloth, $3. The aim of this book is to present in orderly sequence a well-rounded course covering the every-day work of the building contractor's estimator. In addition to the technical and factual data for the actual estimating procedures, the book covers the relation of the estimator to the architect, subcontractors, workmen, etc., and something of the legal side of building work. Two sets of plans and outline specifications are included.

(THE) MACHINISTS' AND DRAFTSMEN'S HANDBOOK. By A. M. Wagener and H. R. Arthur. D. Van Nostrand Co., New York, 1945. 662 pp., illus., diagrs., charts, tables, $8 \times 5^1/_4$ in., fabrikoid, $4.50. The beginning chapters of this reference work deal chiefly with geometrical and trigonometrical constructions and calculations. Basic information on drills, threads, spur gearing, milling, speeds and feeds, and cutting tools is next presented. A considerable amount of tabulated information on the composition, heat treatment, etc., of important metals and alloys is followed by substantial chapters discussing mechanics, logarithms, and the strength of materials. Tables of weights and measures are included.

PRACTICAL MANAGEMENT RESEARCH. By A. R. Wiren and C. Heyel. McGraw-Hill Book Co., New York and London, 1945. 222 pp., charts, tables, $9 \times 5^3/_4$ in., cloth, $2.50. This book discusses the use of scientific research techniques in business, giving in detail the theory, principles, and methods for research into management problems. It describes the analysis of business problems and methods for conducting practical management and time studies. Part II presents case examples of the systematic solution of management problems selected from actual business experience.

PRINCIPLES OF PHYSICS III, OPTICS. By F. W. Sears. Addison-Wesley Press, Cambridge 42, Mass., 1945. 323 pp., illus., diagrs., charts, tables, $9^1/_4 \times 6$ in., cloth, $4. This third volume of a series of physics textbooks covers the field of optics. As with the other volumes in the series, the emphasis is on physical principles. Historical background and practical applications are of secondary importance. Beginning with the nature and propagation of light, the successive chapters carry the subject from the general to the specific, concluding with separate treatments of polarization, line spectra, thermal radiation, photometry, and color.

(A) SHORT DICTIONARY OF ARCHITECTURE. By D. Ware and B. Beatty. Philosophical Library, New York (15 East 40th St.), 1945. 109 pp., diagrs., $8^1/_4 \times 5^1/_4$ in., cloth, $2.75. Both the terms used in classical architecture and the common building terms in current use are included in this dictionary. A great many clear and easily understood drawings illustrate such definitions as need it. The dictionary also includes a number of terms from fields allied to the two main ones. A brief bibliography is appended.

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The items listed below have been furnished by the Engineering Societies Personnel Service, Inc., which is under the joint management of the Four Founder Societies. This service is available to members and is operated on a cooperative, non-profit basis. In applying for positions advertised by the Service the applicant agrees, if actually placed in a position through the Service as a result of these advertisements, to pay a placement fee in accordance with the rates as listed by the Service. These rates have been established in order to maintain an efficient non-profit personnel service and are available upon request. This also applies to registrants whose notices are placed in these columns. All replies should be addressed to the key numbers indicated and mailed to the New York Office.

A weekly bulletin of engineering positions open is available to members of the cooperating societies at a subscription of $3 per quarter or $10 per annum, payable in advance.

Men Available

Construction Engineer-General Superintendent; M. ASCE; registered civil engineer; 25 years' experience in design and construction of highways, streets, and sewer systems; also experienced in building construction; recently on construction and inspection of pneumatic instrumentation for process; available for executive position with contracting or engineering concern. C-175.

Soils Engineer; Jun. ASCE; age 27; single; veteran A.U.S.; C.E. graduate, Rensselaer Polytechnic Institute, 1941; S.M. in soil mechanics and foundations, Massachusetts Institute of Technology, 1945; 3 years' general engineering experience; desire position in soil mechanics and foundations. Location in East preferred but not essential; available immediately. C-177.

Civil Engineer; Jun. ASCE; 27; graduate C.E. in 1940; one year of experience as county engineer; 54 months service in Corps of Engineers; married; available upon discharge in December; will accept position abroad. C-179.

Engineer; Jun. ASCE; professional engineer's license; age 31; 9 years' experience in design, construction, and maintenance of buildings, roads, sewers, railroads, docks, craneways, cranes, shipways, utilities, furnaces, and plant equipment in shipyard. Desire similar position in industrial plant in vicinity of New York, N.Y. C-180.

Civil Engineer; Jun. ASCE; 26; married; one child; graduate C.E., 1942; 3 1/2 years' experience as aircraft structural engineer; 2 years' drafting experience in mapping. Desire position in structural or construction field. Available immediately. C-181.

Construction Engineer and Superintendent; Assoc. M. ASCE; 38; 16 years' experience on location and construction of dams, hydroelectric projects, vehicular tunnels, aqueducts, navigation locks, and large industrial plants. In charge of last four projects mentioned. Experience covers all four corners of the United States. C-182.

Associate Professor of Civil Engineering; Assoc. M. ASCE; 39; experienced administrator; 14 years' successful teaching in civil engineering. Practical experience in hydraulic engineering, highway location and construction, surveying and mapping, and sanitary engineering. Now employed by U.S. government, but wish to return to teaching. C-183.

Civil Engineer; Assoc. M. ASCE; licensed, New York; graduate; 15 years' experience, civil construction and as Civil Engineer Officer in Naval advanced base construction. Varied experience as field, office, costs, and safety engineer, and in duties requiring judgment and executive ability. Interested only in permanent position with future with contractor or consulting engineer. Available immediately. C-184.

Naval Lieutenant; Jun. ASCE; B.S. in C.E.; majored in structures; age 27; married; experienced in airport design; layout and supervision of heavy construction; supervision of Naval construction, new and remodeling of buildings, grading and drainage, paving, etc., field and office. Available January 1946; location, no preference; foreign country acceptable; salary open. C-185.

Sanitary Engineer; Assoc. M. ASCE; design, construction, operation of water, sewage plants; 4 years' experience with state health department on inspection and efficiency improvement of water and sewage plants; 3 years as associate sanitary engineer, U. S. Army, in design and operation of water and sewage plants; 3 1/2 years as U. S. Army lieutenant and captain, Sanitary Corps, Corps of Engineers, on sanitary engineering construction. Salary, $5,000 a year. C-186.

Civil Engineer Corps; Naval Lt. Comdr.; Jun. ASCE; age 31; married; graduate engineer, 1936; 5 years on planning and hydraulic design on flood control projects; 4 years on building, highway, and runway construction, including 2 years in charge of operation of heavy equipment. Desire position with contracting firm, which includes some estimating. C-187.

Graduate; Assoc. M. ASCE; 23 years' experience on railroad, highway, dam, building construction, in all capacities from laborer to responsible charge of construction. Experience in labor relations, personnel and office management, transportation, procurement, supply, contracts. Design experience in structures, railroads, and highways. Commander of engineer construction battalion during Army service. C-189.

Positions Available

Assistant Professors, two. One, for civil engineering, to organize and teach courses in civil field, such as highway and railway engineering, engineering materials laboratory, etc. Should have interest in development or research projects and be capable of directing research studies. The other, for sanitary engineering and public health courses, with some reputation and considerable training and experience in the field. Must be willing to develop and lead research projects in the graduate sanitary field and in connection with engineering experiment station. An interest in state-wide sanitary problems is required. Salaries open. Location, Florida. W-6120.

Construction Engineer, capable of operating terminals, bulk plants, distribution facilities, service station construction and maintenance, manufacturing cans and general engineering work, for the marketing division of an oil company. Starting salary, $5,000 a year. Location, Egypt. W-6121.

Engineers, civil or mechanical graduates, preferably with some drafting or design experience for estimating, designing, fabrication, and erection of all types of structures used in material-handling equipment, such as tramways, cableways, conveyors, skip hoists, etc. Salary $2,500-$3,000 a year. Location, northern New Jersey. W-6131.

Architect, 45–50, with at least 10 years' experience in community building and industrial plant construction, from both the architectural and the structural viewpoint. Should also know the economic side. Salary, $7,800 a year. Location, Delaware. W-6157.

Maintenance and Construction Manager, 40–50, with engineering education, to take general charge of all existing equipment and buildings, and supervise letting of new contracts covering buildings, equipment, fixtures, architectural woodwork, etc., for commercial organization. Salary, $15,000 a year. Location, New York, N.Y. W-6163.

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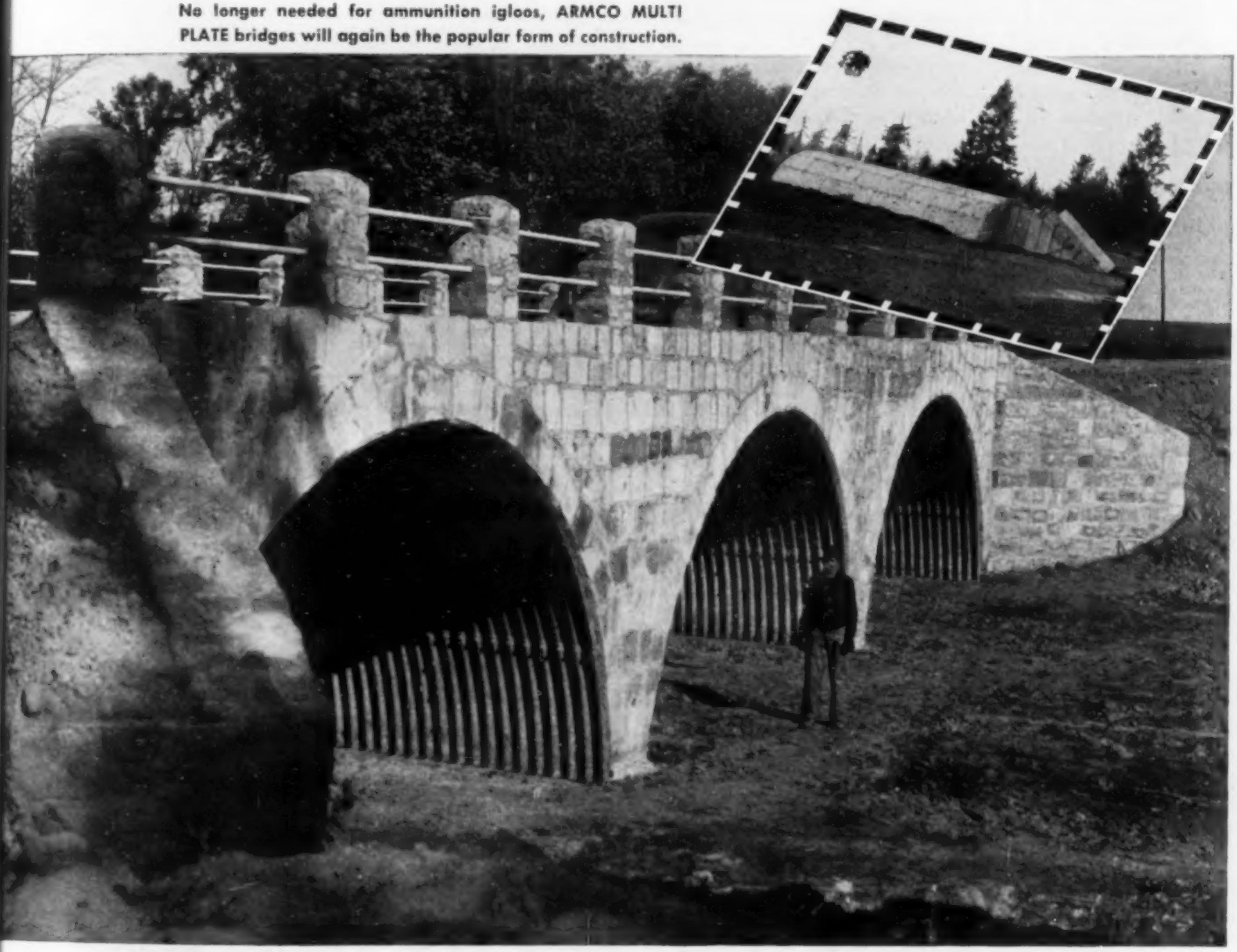

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INSTRUCTOR, civil or mechanical engineering graduates preferred, to teach courses in statics, dynamics, and strength of materials. Some training in advanced mechanics desirable. Salary, $2,000–$2,400 for 9-month period. Location, Missouri. W-6172.

CHIEF ESTIMATOR, with 10 to 15 years' experience in Metropolitan Area, with substational building contractors in estimating departments, to take full charge for general contractor. Salary, $7,000–$8,000 a year. Location, New Jersey. W-6179.

ASSISTANT PROFESSOR OF CIVIL ENGINEERING, preferably young. Chances for advancement are good. Salary, $3,000 for 9 months. Location, North Dakota. W-6184.

ASSISTANT PROFESSOR OF CIVIL ENGINEERING, to teach surveying courses and highway engineering and take charge of some laboratory work. Should have advanced degree. Nine-month college year. Position starts January 4, 1946. Location, New England. W-6186.

ENGINEERS experienced on storm-drain design, and draftsmen, for municipal corporation. Permanent. Write stating salary desired, experience, and qualifications. Location, Maryland. W-6187.

CIVIL ENGINEER, 32–45, with topographical surveying, sewer and water works construction and city paving experience, to assist municipal engineer. Must know Spanish. Salary open. Location, Colombia, South America. W-6202.

ENGINEERS. (a) Hydraulic Engineer for field and office supervision. Should have some experience in the design and construction of dams, particularly stability and safety, as well as some knowledge of stream flow and flood control. Salary, $3,600 a year. (b) Assistant Hydraulic Engineer, junior, to make studies under the direction of the hydraulic engineer. Resident of New Jersey preferred. Salary, $2,600 a year. Location, southern New Jersey. W-6211.

JUNIOR CIVIL ENGINEERS, 25–30, with topographical and plane table surveying experience. Must report single status. Salary, $2,700–$3,300 a year. Location, South America. W-6222(a).

CONSTRUCTION SUPERINTENDENT, preferably with considerable experience on veterans' hospital work, to take charge of one in New England. Must have background in superstructure work. Salary, $6,500–$7,800 a year. W-6235.

ENGINEERS. (a) Test Engineer, M.S. degree and laboratory experience desirable, to take charge of commercial and industrial structures and materials tests. Opportunity to work for doctorate. Salary, about $3,000 a year, one-month vacation with pay. (b) Research Engineer, electrical, mechanical, or civil degree and some experience in materials testing and vibration theory desirable, to work on industrial research program. Salary, about $3,600 a year. (c) Research Fellows to work half-time on industrial research programs and study half-time for M.S. or Ph.D. degree. Salary, $1,080 a year, together with exemption from tuition fees. Summer work available. Location, Pennsylvania. W-6249.

CIVIL ENGINEER, young, to lead a survey party in connection with a storage dam. Salary, about $2,500 a year. Location, Nicaragua. W-6258.

CURRENT PERIODICAL LITERATURE

Abstracts of Articles on Civil Engineering Subjects from Publications (Except Those of the American Society of Civil Engineers) in this Country and Foreign Lands

Selected items for the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file in The Engineering Societies Library, one of the leading technical libraries of the world. Some 2,000 technical publications from 40 countries in 20 languages are received by the Library and are read, abstracted, and indexed by trained engineers. With the information given in the items which follow, you may obtain the article from your own file, from your local library, or direct from the publisher, or they may be borrowed from the Engineering Societies Library. Photoprints will be supplied by this library at the cost of reproduction, 25 cents per page to members of the Founder Societies (30 cents to all others), plus postage, or technical translations of the complete text may be obtained at cost.

BRIDGES

CONCRETE, NEW ZEALAND. Modern Bridging Practice in New Zealand. *Ry. Gaz.*, vol. 83, no. 5, Aug. 3, 1945, pp. 114–115. Reinforced concrete is now standard for arches of all kinds and trestle viaducts on government railways; though bridges are of number of different types, they are all designed to AREA specifications for concrete structures, and to withstand centrifugal force, earthquake shocks, acceleration and braking, as well as unusual dead, live loads and wind pressure; typical examples of various types; diagrams given.

FLOORS. Load Distribution Over Continuous Deck Type Bridge Floor Systems, W. S. Hindman and L. E. Vandegrift. *Ohio State Univ.—Eng. Experiment Station—Bul. No. 122*, May 1945, 22 pp.; see also extracts in *Surveyor*, vol. 104, no. 2800, Sept. 21, 1945, pp. 551–553. Report on field investigation and results concerning distribution of concentrated loads over floors of highway bridges, and proportion of loading which each supporting member will be called upon to carry.

HIGHWAY, KENTUCKY. Highest Highway Bridge East of Mississippi River. *Roads & Streets*, vol. 88, no. 9, Sept. 1945, pp. 82–84 and 86. Traveler used to erect truss members for Kentucky structure which will carry U.S. 25 traffic 250 ft above river; tall piers concreted with 110-ft stiffleg boom; pier reactions of continuous trusses to be checked with hydraulic jacks.

HIGHWAY, MAINTENANCE AND REPAIR. Bailey Truss Spans to Rescue! A. C. Gentry and I. H. Crutcher, Jr. *Better Roads*, vol. 15, no. 9, Sept. 1945, pp. 31–33. Army engineers erect emergency trusses to carry vital war traffic over flood-damaged Texas crossing; Bailey units may have repair value under peacetime conditions.

HIGHWAY, RECORDS. Bridge Records of Florida's State Road Department, W. M. Parker. *Pub. Works*, vol. 76, no. 9, Sept. 1945, pp. 25, 46, and 48. Data on all structures above 20-ft span on state-maintained roads are recorded and periodically kept up to date; maintenance costs are recorded; bridge index by counties is found helpful in re-routing traffic.

HIGHWAY, TEXAS. Texas Bridge Designers Looking Ahead. *Roads & Streets*, vol. 88, no. 7, July 1945, pp. 100–102. Description of and architects drawings of several designs being considered for construction.

MILITARY. Bridging the Rhine. *Mech. Handling*, vol. 32, no. 7, July 1945, pp. 368–370. Permanent Bailey bridge has been erected across Rhine in record time; illustrated description of some of mechanical handling equipment required for this purpose.

MILITARY. British Bridge-Laying Tanks. *Engineer*, vol. 179, no. 4667, June 22, 1945, pp. 493–494. Details of mobile tank bridges, carried on and laid by tanks; bridges are mounted in such manner that when advancing armored divisions are held up by wide ditches or cratered roads, bridge-laying tank can at once lay across obstacle bridge, which all following tanks or vehicles can cross—without single man having to leave his tank or being exposed to enemy fire.

MILITARY. Marines Turn Bridge Builders. *Eng. News-Rec.*, vol. 135, no. 12, Sept. 20, 1945, p. 389. Note on erection of Bailey bridge in Okinawa.

MILITARY. Railway Bridge Over Rhine at Spyck. *Engineer*, vol. 179, no. 4664, June 1, 1945, p. 429. Brief illustrated description of bridge constructed by railway construction and maintenance group of Royal Engineers; it is longest military railway bridge across Rhine; consists of six 35-ft RSJ approach spans, twenty-seven 75-ft 2-girder deck-type UCRB spans, and one 105-ft 4-girder through-type UCRB span, which will be made into lift span at later date.

MILITARY, ALUMINUM. All-Aluminum Floating Bridge. *Roads & Bridges*, vol. 83, no. 7, July 1945, pp. 51–52. New 50-ton bridge known as M-4 bridge, developed by Corps of Engineers, is constructed in three parts—hollow deck balk, removable gunwales, and half pontons; used in attack crossings.

MILITARY, ALUMINUM. Bridges of Aluminum. *Modern Metals*, vol. 1, no. 6, July 1945, pp. 4–5. Outline of problems and their solutions in manufacture of Army M-4 aluminum bridges; forming, joining, and finishing methods discussed as applied to balk, combination reinforcing structural part and flooring portion of bridge.

MILITARY ENGINEERING. Britain's Fighting Sappers in Burma, D. D. Condon. *Military Engr.*, vol. 37, no. 238, Aug. 1945, pp. 322–323. Brief description of work of engineers in bridge construction.

MILITARY, MAINTENANCE AND REPAIR. Repair of Railroad and Highway Bridges in Luzon, W. W. Dillard, Jr. *Military Engr.*, vol. 37, no. 238, Aug. 1945, pp. 306–309. Method used for repair is described; need for speedy construction with handy materials.

NATURAL GAS PIPE LINES. Trussed Creek Crossings for Pipe Lines, E. J. McConnell. *Oil & Gas, J.*, vol. 44, no. 20, Sept. 22, 1945, p. 211. Brief illustrated item describing method developed by Oklahoma Natural Gas Co. for making overhead crossings, using King-type trussed beam with pipe serving as upper chord or main compression member; entire structure is built on bank and then pulled across creek; crossings of this type have been built up to 120 ft in length.

PLATE GIRDER. Riveted Fabrication Used for Long Span Girders of Foster's Ferry Bridge in Alabama, W. N. Woodbury. *Fasteners*, vol. 2, no. 2, 1945, pp. 16–18. Four rows of riveted continuous plate girders support 24-ft roadway; riveted fabricating procedure briefly described; principles of construction present solution to difficult problem in roadway grades and economic spacing of piers.

RAILROAD, MISSOURI. President Harry S. Truman Bridge. *Wood Preserving News*, vol. 23, no. 9, Sept. 1945, pp. 83–84, and 91. Features of bridge across Missouri River at Kansas City, Mo., built by Rock Island Lines and Milwaukee Road; structure was designed for E-72 loading and has total length of 2,633 ft; four major spans at east end include three steel trusses of 253.5 ft each and one lift span of 427 ft over the barge navigation channel of Missouri River; remaining 1,446 ft of length in crossing structure is composed of 19 steel girder spans that form western approach.

STEEL TRUSS, TOPOCK, ARIZ. Deep Caisson Bridge Piers. *Western Construction News*, vol. 20, no. 8, Aug. 1945, pp. 89–93. Piers excavated for Santa Fe Bridge at Colorado River crossing in deepest caissons ever used in water-bearing material, requiring special ruling to use air at more than legal pressure; irregular river bottom formation causes many unforeseen problems; operations carried on from man-made sand islands.

WAR DAMAGE. Destroyed and Damaged Bridges in France. *Engineer*, vol. 179, no. 4668, June 29, 1945, pp. 506–507. Brief illustrated description; as compared with 2,091 bridges destroyed in 1918 and 2,531 in 1940, after armistice, by time of liberation some 5,000 bridges were cut; some 3,100 temporary repairs have been carried out; most of them, however, will permit nothing more than very light traffic; difficulties which are facing "Ponts et Chaussées."

CITY AND REGIONAL PLANNING

GREAT BRITAIN. England Plans Area Changes, S. D. Simon. *Nat. Mun. Rev.*, vol. 34, no. 7, July 1945, pp. 332–336. England seeks to strengthen local government framework through work of commission to review boundaries within counties and make alterations in accordance with present-day needs; local government in England, excluding London which has special system of its own, is carried on by means of two-tier system in

counties and one-tier system in larger towns; inquiry into finance.

PORTLAND, OREGON. Portland Looks Ahead, H. Goodrich, Jr. *Western Machy. & Steel World*, vol. 36, no. 5, May 1945, pp. 200–201 and 232. Postwar picture of Portland, Ore.; confusion in transition from war to peace considered by business executives and others charged with charting city's future course.

PRELIMINARIES. Outline of Preliminary Steps in Community Planning. *Eng. J.*, vol. 28, no. 8, Aug. 1945, pp. 516–518. Discussion of three preliminary steps, which include adoption of legislation, collection of data, and information about existing industries.

TOWNS, DEVELOPMENT. Practical Problems in Growth of Small Towns, R. G. Murdoch. *Surveyor*, vol. 104, no. 2786, June 15, 1945, pp. 319–320. Problems of preparing small towns to meet needs of increased population; area of land available; replanning central area; sanitary facilities.

CONCRETE

AGGREGATES, CORAL. Coral—Good Aggregate in Concrete, J. R. Perry. *Eng. News-Rec.*, vol. 135, no. 6, Aug. 19, 1945, pp. 174–180. Describes characteristics and relative merits of many different kinds of coral which, surprisingly, make quite good concrete aggregate.

AIRPORTS, ALASKA. Asphaltic Concrete Operations at Big Delta, H. T. Hopewell. *Pac. Bldr. & Engr.*, vol. 51, no. 8, Aug. 1945, pp. 44–45. Problems of transportation and paving at airport project; special oven designed to warm cutback asphalt.

AIRPORT RUNWAYS. Air-Entrained Concrete Permits Earlier Pavement Finish. *Construction Methods*, vol. 27, no. 8, Aug. 1945, p. 98. Time saved in use of concrete slab containing air-entraining cement at Stewart Field, Newburgh, N.Y.; absence of bleeding makes it possible for finishing operations to follow closely behind paving mixer.

AIRPORT RUNWAYS. Enlarging Randolph Field for 120,000-Lb Planes. *Roads & Streets*, vol. 88, no. 8, Aug. 1945, pp. 70–72. Use of 10- and 11-in. concrete on flexible base; contractors produced all aggregates and base materials; brief highlights on design, field methods, and material production given.

CONCRETE SLAB. Two-Span Flat Slab Bridges, A. W. Hill. *Surveyor*, vol. 104, no. 2793, Aug. 3, 1945, p. 427. Table of slab thicknesses and reinforcement details, revised in accordance with new Memorandum No. 577 on Bridge Design & Construction by Ministry of Transport; revision of allowable stresses.

CONSTRUCTION, DESIGN. Design of Doubly Reinforced Sections Having Minimum Percentage of Reinforcement, A. Feldmann. *Concrete & Constr. Eng.*, vol. 40, no. 8, Aug. 1945, pp. 153–167. Outline of method of design aimed at producing savings in time and material.

READY MIXED, SOUTH CAROLINA. Ready-Mix Firm Expands Facilities to Produce Concrete Masonry Units, W. M. Avery. *Pit & Quarry*, vol. 38, no. 1, July 1945, pp. 179–180 and 183. Description of equipment and methods at plant of Greenville Concrete Co., which has installed block plant utilizing some equipment and facilities of ready-mixed plant.

ROADS AND STREETS. Modern Concrete Paving Practice, D. O. Robinson. *Roads & Bridges*, vol. 83, no. 8, Aug. 1945, pp. 59–62, 96, 98, and 100. Discussion of lane width, slab thickness, quality of concrete, joints, aggregates, construction methods, inspection and control, and use of air-entraining agents.

WATER TANKS AND TOWERS. Design and Construction Features of Pre-stressed Concrete Storage Tank at Great Falls, Montana, M. E. Chamberlin. *Pac. Bldr. & Engr.*, vol. 51, no. 8, Aug. 1945, pp. 38–40; see also *Pub. Works*, vol. 76, no. 8, Aug. 1945, pp. 24–26. Problems in design and construction are briefly reviewed; nature of problems arose from size of 4,750,000-gal tank.

WIND, CONCRETE. Shuttering for Concrete Wind Tunnel. *Concrete & Constr. Eng.*, vol. 40, no. 7, July 1945, pp. 136–137. In construction of wind tunnel for high-velocity testing at aircraft laboratory, shuttering for concrete surface was designed that would not deviate more than $^1/_{64}$ in. from specified curvature, and thus dispense with plastering to produce true profile.

DAMS

BUTTRESS, AUSTRALIA. Construction of Massive Buttress Dam at Lauriston, Victoria, H. H. C. Williams. *Instn. Engrs. Australia—J.*, vol. 16, no. 12, Dec. 1944, pp. 225–234; see also abstract in *Civ. Eng.* (London), vol. 40, no. 469, July 1945, pp. 152–153, and 157. Details of design and construction of dam with crest length of 800 ft and height of 80 ft.

WEIRS, DISCHARGE. Gauging of Streams and Pump Discharges, R. McAdam. *Power & Works Engr.*, vol. 40, no. 470, Aug. 1945, pp. 180–182. Article gives fundamental equations used with V-notches, suppressed rectangular weirs, and fully

contracted rectangular weirs, discusses features of their employment essential to accuracy and provides nomographs to assist in routine measurements by the aid of streams, circulating water and other considerable volumes of water.

FOUNDATIONS

BRIDGE PIERS. Application of Soil Mechanics to Bridge Foundation Problem, E. W. C. Godfrey. *Instn. Engrs. Australia—J.*, vol. 17, no. 3, Mar. 1945, pp. 59–64. Paper relates specifically to foundations for proposed bridge across Swan River at site approximately parallel with existing causeway, Perth, Western Australia; investigates distribution of stress on clay substratum due to pile loadings, piles being driven into sand overlying clay and founded with their toes some height above clay bed; shows that stresses so imposed are safe.

PILES, BEARING CAPACITY. Bearing Piles, R. R. Minikin. *Civ. Eng.* (London), vol. 40, nos. 465, 466, 467, 468, and 469; Mar. 1945, pp. 64, 66–68, 70, 72; Apr., pp. 84–86, 88; May, pp. 112, 114, 116–118; June, pp. 132–134; July, pp. 158, 160, 162, 164–165. Method of driving, strength as unit, physical structure of strata, and safe load to avoid creeping through soil are considered as factors in use of bearing piles as load-carrying units of foundations.

HYDRAULIC ENGINEERING

TENNESSEE VALLEY AUTHORITY. TVA Builds Power Empire on Tennessee River. *Power*, vol. 89, no. 9, Sept. 1945, pp. 601–604. Brief illustrated description of development of system.

HYDROLOGY AND METEOROLOGY

METEOROLOGY, AN AID TO ENGINEERS. Meteorology—Aid to Electrical Engineers, F. J. Mahaffy. *Elec. Eng.*, vol. 64, no. 8, Aug. 1945, pp. 290–294. Popular notions upholding either infallibility or invariable error of predictions of "weather man" are dispelled; discussion examines recent advances that have broadened range and scope of weather prediction, factors entering into forecasting process, and specific meteorological information electrical industry can expect for aid in both its long-range and day-to-day operations. Before Am. Inst. Elec. Engrs.

RAIN AND RAINFALL, AUSTRALIA. Intensity, Frequency, & Distribution of Heavy Rainfall in N.S.W., J. F. McIllwraith. *Instn. Engrs. Australia—J.*, vol. 16, no. 12, Dec. 1944, pp. 240–252. Analysis and tabular data given on distribution of intense rainfall in New South Wales; factors affecting rainfall in general are discussed and rainfall equations derived from statistical data. Bibliography.

RUN-OFF. Runoff and Storage Prospects—1945. *Elec. West*, vol. 94, no. 5, May 1945, pp. 63–65. Information prepared by Division of Irrigation, U.S. Soil Conservation Service, from data furnished by federal, state, and private cooperative show survey networks in Western states.

RUN-OFF. Surface Runoff Potentials of Some Utah Range-Watershed Lands, L. Woodward and G. W. Craddock. *J. Forestry*, vol. 43, no. 5, May 1945, pp. 357–365. Description of rainfall and infiltration characteristics responsible for overland flow on some of mountain lands in Utah; basic data are combined in three theoretical analyses to show amount of surface runoff to be expected from number of sites when subjected to major storm; minimum storm that will produce runoff; frequency at which runoff can be expected; results. Bibliography.

WATERSHEDS, WASHINGTON. Seattle and Its Cedar River Watershed, W. C. Morse. *Western City*, vol. 21, no. 8, Aug. 1945, pp. 29–31. Progress and developments of plan to acquire all Cedar River watershed lands as source of supply for municipal water system of Seattle; negotiations for acquisition of area discussed.

LAND RECLAMATION AND DRAINAGE

CHART, DRAINAGE. Chart for Drainage Calculations, D. E. Donovan. *Eng. News-Rec.*, vol. 135, no. 8, Aug. 23, 1945, pp. 250–251. New formula will aid designer of small drainage structures in quickly and accurately determining time of concentration necessary in calculating storm flows; chart is presented to aid in solving problems involving use of formula.

PORTS AND MARITIME STRUCTURES

JETTIES. Jetty Built to Resist Heavy Seas, *Eng. News-Rec.*, vol. 135, no. 8, Aug. 23, 1945, pp. 252–254. Outer portions of Columbia River jetty have been rebuilt with concrete terminal and toe walls planned for maximum resistance to high, storm-driven waves; design and methods of construction are based on long experience with damage from extremely severe wave action.

NEW ZEALAND. Greymouth and Westport, N. Z. *Dock & Harbour Authority*, vol. 26, no. 297, July 1945, pp. 68–69. Brief discussion of improvement projects at two New Zealand harbors.

SEAWALLS, NEW ZEALAND. Plimmerton-Paekakariki Coast Highway, H. L. Hume. *New Zealand Instn. Engrs.—Bul. & Proc.*, vol. 29, no. 4, Jan. 15, 1944, pp. 233–243, 10 supp. plates. Highway involved 3-mile section along coast subject to severe storms; successful design of seawall would provide storm protection and keep roadway clear of falling water; notes give factors in design of seawall, how final section was evolved by use of scale models, and features of results achieved.

ROADS AND STREETS

ACCESS. Access Road to Atomic Bomb Plant. *Roads & Streets*, vol. 88, no. 8, Aug. 1945, pp. 74–75. Paved gutter along median strip handles surface drainage; simple labor-saving methods used to excavate center ditch and place 3½ miles of gutter pavement, for 4-lane access highway project to now famous Clinton Engineering Works near Knoxville, Tenn.

AIRPORTS, CHINA-BURMA-INDIA. War Construction in Asia Contrasts Ancient and Modern Techniques, S. C. Godfrey. *Construction Methods*, vol. 27, no. 8, Aug. 1945, pp. 64–68, 166, 170, and 172. Group of airfields in China constructed by dint of mass labor and hand tools, and group of airfields in Burma built with modern equipment illustrate contrast; construction described.

AIRPORTS, MAINTENANCE AND REPAIR. Establishment and Maintenance of Cover on Unpaved Surfaces of Airports, R. H. Morrish. *Eng. News-Rec.*, vol. 135, no. 8, Aug. 23, 1945, pp. 240–241. Methods for keeping unpaved areas free from dust and mud described.

AIRPORTS, NOVA SCOTIA. Construction of Yarmouth Airport, B. Hanley. *Roads & Bridges*, vol. 83, no. 6, June 1945, pp. 72–74. Description of construction, which has been continuous since 1939 due to numerous additions and extensions; aprons are of concrete; runways are asphaltic construction; notes on aggregate production, paving operations, equipment, and drainage.

ALASKA. Construction of By-Pass to Snow-Slide Gulch on Richardson Highway, H. Sterling. *Pac. Bldr. & Engr.*, vol. 51, no. 8, Aug. 1945, pp. 46 and 83. Description of operations which involved tunneling through solid rock, blasting road out of face of rock cliff, making fills, and constructing bridges and trestles.

ASPHALT. How Detroit Is Sealing 1,000,000 Sq Yd of Old Asphalt, C. Shattuck. *Roads & Streets*, vol. 88, no. 8, Aug. 1945, p. 79. Specification and sequence of operations used in treating old cracked sheet asphalt and asphaltic concrete with sand-asphalt seal.

AUSTRALIA. Bituminous Treatment of Stuart Highway from Alice Springs to Larrimah, R. C. Jones. *Instn. Engrs. Australia—J.*, vol. 17, nos. 4–5, Apr.–May 1945, pp. 69–77. Reconstruction and bituminous treatment of 622 miles of road between railroads of Alice Springs and Larrimah, was carried out between April 1942, and December 1943; investigation showed the existence of unusual conditions requiring special types of construction; paper analyzes problems and discusses methods adopted in dealing with them.

BITUMINOUS. Open Graded Hot-Mix Successful in N. California. *Roads & Streets*, vol. 88, no. 8, Aug. 1945, pp. 82–83. Permeable type of resurface adopted to help eliminate roadbed moisture on bituminous pavements during wet season; methods on two contracts described.

BRITISH COLUMBIA. Routing of Traffic Through Vancouver, M. E. Ray. *Western City*, vol. 21, no. 8, Aug. 1945, pp. 32–33. Contemplated street improvement project for more direct and efficient method of routing intercity traffic through Vancouver; financing planned by federal and state highway and city funds.

CALIFORNIA. War Time Highway Construction in District V Aggregated $9,500,000. L. H. Gibson. *Calif. Highways & Pub. Works*, vol. 23, nos. 7–8, July–Aug. 1945, pp. 21–25 and 29. Brief description of access roads and other projects constructed since 1941.

CANADA. Highway, Bridge and Aerodrome Construction in Canada. *Roads & Bridges*, vol. 83, no. 6, June 1945, pp. 59–62, 204, and 206. Statistical review of accomplishments in field of "Roads and Bridges" under prewar and wartime conditions.

CURVES. Horizontal Curvature Chart Aids Road Design. *Roads & Streets*, vol. 88, no. 8, Aug. 1945, p. 90. Graph developed by California division of highways for determining minimum radius of curve.

HIGHWAY ACCIDENTS. Study Shows Accidents on Arroyo Seco Parkway Are Less Than on Some Los Angeles City Streets, R. E. Pierce. *Calif. Highways & Pub. Works*, vol. 23, nos. 7–8, July–Aug. 1945, pp. 1–3 and 30. Comparison of accident rates on parkway and on city streets of comparable traffic volume.

HIGHWAY SYSTEMS, CALIFORNIA. Highways of California, J. D. Gallagher. *Calif. Highways & Pub. Works*, vol. 23, nos. 7–8, July–Aug. 1945, pp. 4–8 and 28. Various problems encountered in construction and maintenance of highways; Redwood highway; Shasta Dam relocation; Feather River highway.

HIGHWAY SYSTEMS, PAN-AMERICAN. Inter-American Highway Cuts Through Costa Rican Mountains, J. L. Harrison. *Construction Methods*, vol. 27, no. 8, Aug. 1945, pp. 84–88, 180, 182, 184, and 186. Account of difficulties encountered on 71-mile section of highway through Talamanca Mts. in Costa Rica.

JOINTS. Joints in Concrete Roads, T. R. Grigson. *Concrete & Constr. Eng.*, vol. 40, nos. 6 and 7, June 1945, pp. 111–117, July, pp. 138–146. Joints should be so designed and spaced as to permit entire roadway to expand, contract, and warp with minimum of restraint; joint fillers and types of joints discussed.

MILITARY ENGINEERING. Licking Army's Mud and Dust, B. H. Petty. *Better Roads*, vol. 15, no. 8, Aug. 1945, pp. 25–26 and 30. Problems of building roads for heavy mechanized equipment.

MILITARY ENGINEERING. Roadbuilding at Pacific War Base, R. P. Day. *Roads & Bridges*, vol. 83, no. 7, July 1945, pp. 57–59 and 76. Three-lane asphalt-paved roads, each lane 11 ft wide with 6-ft shoulder strips, laid on coral rock foundations; construction and maintenance problems.

MINNESOTA. Triple Push Loading Speeded Minnesota Grading Job. *Roads & Streets*, vol. 88, no. 8, Aug. 1945, pp. 61–64. Highlights of construction of 7.88-mile section of Minnesota Trunk Highway 100, including two drain sections two small bridges, railroad underpass, and 730-ft. seven-span bridge.

SNOW AND ICE CONTROL. How Pennsylvania Kept 'Em Open, L. J. Curran. *Roads & Streets*, vol. 88, no. 8, Aug. 1945, pp. 84–86. Description of organization and work of snow removal.

SANITARY ENGINEERING

MOSQUITO CONTROL. Drainage Canals Aid Mosquito Control in TVA Reservoir Areas, H. E. Davis. *Eng. News-Rec.*, vol. 135, no. 8, Aug. 23, 1945, pp. 229–231. Swamps along edges of TVA lakes, as well as depressions within fluctuation zones of impounded waters, are connected with deeper parts of reservoirs by drainage canals; breeding locations of malaria mosquito are thus eliminated; methods used in digging these canals are described and unit costs are given.

SEWERAGE AND SEWAGE DISPOSAL

ACTIVATED SLUDGE. Autoxidation Process, H. E. Keyes and D. Travaini. *Water Works & Sewerage*, vol. 92, no. 8, Aug. 1945, pp. 249–254. Development and operation of process for producing ferrous sulfate, ferric sulfate, or sulfuric

acid for use when needed to supplement plain flocculation.

ACTIVATED SLUDGE. Operating Fundamentals of Activated Sludge Process, T. R. Haseltine. *Surveyor*, vol. 104, no. 2797, Aug. 31, 1945, pp. 497–500; see also *Water Works & Sewerage*, vol. 92, no. 6, June 1945, pp. R197–200. Problems of maintaining balance between adsorptive and oxidizing power; causes of oxidation lag; control tests; troubles.

INDUSTRIAL WASTES. Chemical Treatment of Soapy Waste Waters, H. W. Gehm. *Water Works & Sewerage*, vol. 92, no. 8, Aug. 1945, pp. 244–247. Results of experiments on various methods of treating soapy waste waters; treatment with sea water; effects of calcium, magnesium, and sodium chlorides; treatment of synthetic rubber polymerizing soap; reduction in oxygen-consumed value.

INDUSTRIAL WASTES. Industrial Waste—Important Factor in Process Planning. *Chem. & Met. Eng.*, vol. 52, no. 8, Aug. 1945, pp. 117–124. Report emphasizes importance of waste treatment, in view of trends in legislation, and outlines some of methods employed.

INDUSTRIAL WASTES, PICKLING PLANTS. Treatment of Spent Pickling Liquors with Limestone and Lime, R. D. Hoak, C. J. Lewis, and W. W. Hodge. *Indus. & Eng. Chem.*, vol. 37, no. 6, June 1945, pp. 553–559. Substantial economy in pickle liquor treatment can be realized by using pulverized high calcium limestone, to neutralize free acid and precipitate part of iron, and lime of complete treatment; commercial operation of limestone lime split treatment is described.

SEWERS, CONSTRUCTION. Sewer Construction Difficulties Eased by Dewatering Quicksand. *Sewage Works Eng. & Mun. Sanitation*, vol. 16, no. 9, Sept. 1945, pp. 436–437. Wellpoint system simplifies pipe-laying job involving abundance of ground water.

SEWERS, MAINTENANCE AND REPAIR. Sewer Repair Race Against Time. *Eng. News-Rec.*, vol. 135, no. 6, Aug. 9, 1945, pp. 154–59. When large, brick, trunk sewer of egg-shaped section in Syracuse, N.Y., collapsed, difficulties to be overcome included handling anticipated 10 to 50 mgd of sewage and runoff from melting snow, and securing sufficient labor to complete repairs before expected heavy spring rains set in; flow was bypassed through 20-in. siphon 350 ft long, with 24-in. low-head centrifugal pump as booster in line; German prisoners of war were utilized as common labor for repair work.

TREATMENT PLANTS, ONTARIO. Extensive Sewerage Improvements Planned for Sault Ste. Marie, G. G. Reid. *Water & Sewage*, vol. 83, no. 6, June 1945, pp. 23–24, and 52–56. Sewage treatment plant, new sewers, and interceptors to cost $1,400,000 will provide for city's growth and minimize pollution of boundary waters.

TREATMENT PLANTS, SOMERSET, KY. Activated Sludge Plant, Somerset, Ky., C. N. Harrub. *Sewage Works Eng. & Mun. Sanitation*, vol. 16, no. 9, Sept. 1945, p. 445. Flow diagram, description, and equipment inventory of plant given.

STRUCTURAL ENGINEERING

ARCHES, WOODEN. Glued, Laminated Arches Built of Treated Wood. *Construction Methods*, vol. 27, no. 8, Aug. 1945, p. 94. Glued, laminated three-hinged arch construction employing wood pressure treated for durability and fire resistance provides required headroom of 15 ft, with lower side walls and less cubage, in new 30 by 40-ft repair shop for locomotives at treating plant of American Lumber & Treating Co., Gainesville, Fla.

CONCRETE REINFORCEMENT. Prestretched Reinforcement Makes Concrete Beams Stronger. *Eng. News-Rec.*, vol. 135, no. 8, Aug. 23, 1945, p. 244. Note on tests by B. J. Lamoert and N. L. Ashton of State Univ. of Iowa, to investigate possibility of increasing strength of concrete beams through use of prestretched reinforcing bars.

TUNNELS

CONSTRUCTION, MILITARY ENGINEERING. Seabees Drive Tunnel Through Mud Seams and Coral. *Construction Methods*, vol. 27, no. 8, Aug. 1945, p. 73. Illustrated note on methods used in tunneling 6 by 7-ft drift through 200 ft of mud seams and coral rock.

WATER PIPE LINES

CLEANING. Sterilization of New Water Mains, W. H. Austin. *Water & Water Eng.*, vol. 48, no. 591, July 1945, pp. 395–399. Notes on problems of sterilization and methods used by author.

CONCRETE. Difficult 54-Inch Concrete Pipe Line Installation Job, W. A. Kunigk. *Pub. Works*, vol. 76, no. 7, July 1945, pp. 20–22. Replacement of 12,251 ft of wood-stave pipe 46 in. in diameter with equal length of 54-in. diameter steel cylinder lock joint concrete pipe in Tacoma, Wash.; construction through peat bog and other soft ground; designing, laying, and testing pipe.

WATER RESOURCES

MILITARY ENGINEERING. Water Supply for Caribbean Island Base, D. C. Senges and K. B.

Townsend. *Pub. Works*, vol. 76, no. 7, July 1945, pp. 28, 42, and 44. Water supply system developed for island Army base where there were no natural bodies of surface water and where there had never been development of ground water; over 3 years of operation have proved adequacy and reliability of system.

MILITARY ENGINEERING. Water Supply on Pacific Islands, J. L. Sherill. *Eng. News-Rec.* vol. 135, no. 6, Aug. 9, 1945, pp. 166–170. At Guadalcanal initial supplies were obtained from shallow wells, following which drilled and surface supplies were developed; on Emirau Island coral and limestone formations were tapped to provide abundant sources of water; filtration and chlorination facilities were improvised on several occasions to meet special conditions.

WATER TREATMENT

CHLORINATION. Why Use "Break-Point"? E. E. Chandler. *Water Works & Sewerage*, vol. 92, no. 5, May 1945, pp. 159–160. Advantages in use of break-point chlorination, based on experience at plant of Beckley, W.Va., Water Co.

COLOR REMOVAL. Water Treatment at Ottawa, Ontario, H. P. Stockwell, Jr. *Am. Water Works Assn.—J.*, vol. 37, no. 7, July 1945, p. 640. Problems of treatment at Ottawa where raw water has average color of 40, alkalinity of 23, and pH of 7.1; high chlorine demand discussed.

FILTRATION. Porous-Plate Underdrainage for Rapid Water Filters, F. C. Roe. *Water & Sewage*, vol. 83, no. 6, June 1945, pp. 19–22. Eight years of experience indicates that porous plates provide simple, practical, and economical solution to underdrainage problems.

FILTRATION PLANTS, COLUMBIA, PA. Emergency Filter Plant Avoids Repetition of Recent Shutdown, I. M. Glace. *Water Works Eng.*, vol. 98, no. 11, May 30, 1943, pp. 610–613. Construction and use of emergency filter plant by Columbia, Pa., Water Co., built after floods destroyed regular plant; river conditions set forth from actual flow and flood records.

FILTRATION PLANTS, CONCRETE CONSTRUCTION. Special Steel Forms Speed Concreting at Chicago's Water Filtration Plant, *Eng. News-Rec.*, vol. 135, no. 26, June 28, 1945, pp. 898–901. Steel forms expedited pouring of 720 reinforced concrete wash-water troughs at Chicago's South District filtration plant; other labor-saving devices included roller-mounted concreting platform and special lifting frame for settling forms, operated by overhead hoist traveling along temporary trolley beams.

FILTRATION PLANTS, MAINTENANCE AND REPAIR. Overcoming Filter Bed Troubles. *Water Works Eng.*, vol. 98, no. 11, May 30, 1945, pp. 618, 635–636. Methods of cleaning filter bed of mud that has been removed from water but remains in filter sand.

FILTRATION PLANTS, MONTREAL. Montreal Filtration Plant Extension, F. Y. Dorrance. *Water & Sewage*, vol. 83, no. 5. May 1945, pp. 19–22, 42–44. Capacity to be increased from 150 to 200 mgd by construction of 16 filters of rapid-sand type.

OKLAHOMA CITY, OKLA. Doubling Capacity of Water Plant, K. Klaffke. *Eng. News-Rec.*, vol. 134, no. 18, May 3, 1945, pp. 656–658. Oklahoma City installed pretreatment facilities and other improvements, thus doubling capacity of filtration plant without constructing additional filters; installation meets demands of 32 mgd and produces higher quality water.

PRETREATMENT. Pretreatment of Water for Effective Fltration, C. R. Cox. *Pub. Works*, vol. 76, no. 5, May 1945, pp. 21–25, 46, 48–49, 52, and 54. Principles of coagulation, use and control of coagulants, reasons and equipment for rapid mixing and flocculation, and calculating detention period of sedimentation tanks discussed in detail.

TASTE AND ODOR CONTROL. New Taste and Odor Control Process. *Am. City*, vol. 60, no. 6, June 1945, pp. 110–111. Description of process of chlorine dioxide treatment and brief reports from several superintendents on experience with process.

TREATMENT PLANTS, UNITED STATES. Census of Recent Water Treatment Plants. *Pub. Works*, vol. 76, no. 8, Aug. 1945, pp. 28–30. Sources of supply and methods of disinfection, filtration, aeration, coagulation, sedimentation, and other treatment installed during 1943 at 151 plants in United States.

WATER BACTERIOLOGY. Simplified Bacteriological Procedure for Examination of Water, C. A. Hunter, E. Patty, and F. McKinley. *Water Works & Sewerage*, vol. 92, no. 8, Aug. 1945, pp. 241–242. Description of simplified method that uses larger quantity of water and eliminates gas production in presumptive test.

WATER FILTRATION. Coarse-Filtering Mountain Stream for Red Lodge, Montana, W. P. Burke. *Pub. Works*, vol. 76, no. 6, June 1945, pp. 24–26. How intake was constructed for intercepting clear, cold water from mountain stream after filtering through coarse sandy soil.

WATER FILTRATION. Filter Problem and How It Was Solved, F. D. Behan. *Pub. Works*, vol. 76, no. 5, May 1945, pp. 26–29. Formation of mud balls and rapid clogging of filters was not prevented by longer wash periods at minimum washing rates; trouble was eliminated by use of anthrafilt and filter agitators.

WATER FILTRATION. Incrustation of Water-Filtration Sand, R. A. Thuma. *Eng. News-Rec.*, vol. 134, no. 18, May 3, 1934, pp. 650–655. Recent investigation and analysis of sand from two representative filters of St. Paul, Minn., filtration plant disclose amount of incrustation on particles of sand; chemical analyses made to determine character of coatings.

WATER FILTRATION. Surface Wash for Filter Beds. *Water Works Eng.*, vol. 98, nos. 12 and 13, June 13, 1945, p. 668, June 27, pp. 729, and 750–751. Surface wash system based on principle of applying numerous fine jets of water at high velocity to top of sand bed; use of system at Chicago plant; construction details of fixed-type surface wash system used at Milwaukee, Wis., plant; C. E. Palmer system.

WATER FILTRATION, MATERIALS. Filter Sand Grading, J. Tarrant. *Water Works & Sewerage*, vol. 92, no. 7, July 1945, pp. 218–219. Method presented aims to tie in A. Hazen and J. R. Baylis methods, to link up screening with Effective Size and Uniformity Coefficient, and to give means whereby large and small grains may be brought into line with Uniformity Coefficient as may be specified.

WATER WORKS ENGINEERING

CANADA. Waterworks and Sewage Plants, A. E. Berry. *Water & Sewage*, vol. 83, no. 7, July, 1945, pp. 21–3 and 40. Statistical data on growth, cost, and methods adopted by municipalities from coast to coast; great postwar activity in sanitary works anticipated.

JACKSON, MISS. Postwar Program for Jackson, Mississippi, E. L. Filby. *Am. Water Works Assn.—J.*, vol. 37, no. 8, Aug. 1945, pp. 724–28. Description of improvements planned for water and sewage systems.

LAND UTILIZATION. Problem of Municipal Water Works Land Owner, W. R. La Due. *Water Works & Sewerage*, vol. 92, nos. 6 and 7, June 1945, pp. 181–186, July, pp. 209–215. Particular reference to miscellaneous land uses; use of orchard areas, reforestation, and other methods employed in cultivating protective areas around water works.

MAINTENANCE AND REPAIR. Wartime Maintenance Problems, H. S. Dowey and H. M. Huy. *Am. Water Works Assn.—J.*, vol. 37, no. 8, Aug. 1945, pp. 738–741. Problems of manpower, equipment, water supply, transmission and distribution lines, and materials.

POSTWAR, MICHIGAN. Postwar Plan Fills Wartime Water Need, H. E. Smith. *Am. City*, vol. 60, no. 8, Aug. 1945, pp. 72–73. Development of plant to meet increased demand.

QUEBEC. Services to Small Populations in Quebec Difficult Problem, R. Cyr. *Water & Sewage*, vol. 83, no. 7, July 1945, pp. 24–26 and 144. Four typical cases from engineer's notebook show how provincial Health Department attempts to help even smallest communities in their sanitary projects.

WATER WELLS, DRILLING. Difficulties Encountered in Drilling for Water, H. T. Burgess. *S. African Instn. Engrs.—J.*, vol. 43, no. 4, Feb.–Mar. 1945, pp. 115–117. Paper deals chiefly with job of fishing for broken drilling tools in hole cased with 6-in. pipe; to recover cable tools, casing was withdrawn and hole reamed for 8-in. casing.

WARTIME DEVELOPMENTS. Water Supply. *Am. J. Pub. Health*, vol. 35, no. 7, July 1945, pp. 743–750. Wartime developments are appraised in connection with public water supplies which appear to have peacetime significance. Report of Committee on Water Supply, Am. Pub. Health Assn.

WATER TANKS AND TOWERS, COLLAPSIBLE. Collapsible Water Tank of Glass Fabric Coated with Synthetic Rubber. *Water & Water Eng.*, vol. 48, no. 589, June 1945, p. 294. Tank made of glass fabric coated with synthetic rubber, developed by U.S. Rubber Co. and U.S. Army Engineers, has capacity of 3,000 gal.; when set up, tank is 4 ft 6 in. high and 11 ft in diameter.

WATER TANKS AND TOWERS. Waukegan Gets Needed Water Storage, H. B. Bleck. *Am. City*, vol. 60, no. 8, Aug. 1945, p. 91. Details of design and construction of new tank with internal diameter of 70 ft, depth of 28 ft, and capacity of 800,000 gal.

WATER WORKS, EQUIPMENT. Denver, Colorado—Survival and Retirement Experience with Water Works Facilities. *Am. Water Works Assn.—J.*, vol. 37, no. 8, Aug. 1945, pp. 777–838. Installation and retirement study of mains, valves, hydrants, and lead services.

Equipment, Materials and Methods

New Developments of Interest, as Reported by Manufacturers

Concrete Mixers

CONCRETE MIXERS GO STREAMLINED states the announcement of Chain Belt Co.'s line of Rex mixers. First to be in actual production is the new Rex 6S. Features include a completely redesigned chassis—low over-all height, wide wheel tread, and low center of gravity. The machine is easy to park, tow, and spot. New convenient controls, grouped on one side of the machine, a new water system, and new drum design result in easier operation and better mixing qualities.

The redesigned 11 and 16S meet the new A.G.C. standards. The 11S is available in either a 2- or 4-wheel mount—end discharge type. The 16S is mounted on a 4-wheel chassis—side or end discharge types. Improvements include the relocating of lubrication fittings for convenient greasing—choice of air and water-cooled motors, redesigned water system, and a new slip-stream shimmy skip.

All-Steel "Handiwinch"

THE AMERICAN "Handiwinch" is an all-steel construction hand power unit, consisting of a drum mounted between two side frames rigidly held together by two threaded shouldered tie bolts and a stationary drum shaft. The drum shaft is welded to one side frame and pinned to the other. The drum can be driven either through 27:1 double reduction gears for five-ton loads, or 4.5:1 single reduction gears for light loads. The pinion meshing with the internal gear on the drum can be disengaged to facilitate pulling rope off the drum by hand. All gears are held in place by one simple latch, making the shifting or removal of gears a very easy task. A band brake provides safe handling of heavy loads without creep. The total weight is $107^1/_2$ lb. and dimensions overall are $16^1/_2 \times 15^1/_2 \times 16^3/_4$ in. high. Further details from American Hoist & Derrick Co., St. Paul 1, Minn.

Richmond Screw Anchor Agents

AN ANNOUNCEMENT from Mr. Charles A. Snyder, President of the Richmond Screw Anchor Co., Inc., 816 Liberty Ave., Brooklyn, N.Y., states that the following concerns have been appointed as representative for all Richmond Form Tying Devices: Building Materials & Equipment Co., Anderson, S.C.; Choctaw Culvert & Machinery Co., Little Rock, Ark.; DeForest & Hotchkiss Co., 115 Water St., New Haven 11, Conn.; Empire Builders Supply Co., Inc.; 820 Cedar Ave., Niagara Falls, N.Y.; Furnival-Rimmer Co., S.E. cor. N. Cameron & Forster Sts., Harrisburg, Pa.; Globe Plaster Co., 154 Huron St., Buffalo, N.Y.; Hausman Steel Co., 799 Goodale Blvd., Columbus, Ohio; Hausman Steel Co., 300 Sandusky St., Toledo, Ohio; Heckman Building Products Co., 4018 West Lake St., Chicago, Ill.; Richardson & Sons, 340 Perry St., Trenton, N.J.; Geo. L. Wilson & Co., 310 Mendota St. and P.R.R., N.S. Pittsburgh, Pa.

Cement Batching Plant

A NEW TYPE portable twin-silo cement batching plant, with storage capacity up to 1600 barrels, has been developed by the C. S. Johnson Company of Champaign, Ill. Plants of similar design in capacities of 761, 1044 and 1327 barrells are also offered.

Constructed of all-welded units, Johnson's new "twin" cement plant can be set up faster. Although it is the largest portable unit in the complete Johnson line, it can be erected without a crane, if desired. The leg section on the overhead silo is so designed that it can pivot on a base plate mounted in the concrete footing. The pivot can then be utilized to tip the entire leg and silo assembly into place by means of a gin pole and a tractor winch.

Other equipment used with this up-to-date plant includes the Johnson cement batcher and bucket elevator and screw conveyor with capacities of 300 barrels per hour. The Johnson Bin-Gage indicates high or low level of cement in silo. The Twin Silo may be charged from box or hopper cars, or from trucks.

Caterpillar Bulldozers

"CATERPILLAR" CABLE-CONTROLLED bulldozers and scrapers, announced as an addition to the company's line of products more than a year ago, are now in production as the result of a lifting of WPB restrictions, it is announced by Caterpillar Tractor Co., Peoria, Ill. Delivery of bulldozers for "Caterpillar" Diesel D8, D7, and D6 track-type tractors is scheduled late this year, with delivery of the scrapers in several sizes scheduled for early 1946.

Manufacture of the bulldozers and scrapers marks "Caterpillar's" entry into this field of industry. Matched in capacity to the power of the tractor and matched in design, materials, and workmanship to the high quality of other company products, they are priced in keeping with "Caterpillar's" policy of building the best possible machines to be sold to the user at reasonable prices. The new products, which have been subjected to thorough testing on the company's proving grounds and at numerous locations, will be sold and serviced through "Caterpillar" dealers.

Among the outstanding advantages of "Caterpillar" bulldozers are: balanced design, great capacity, rigid construction, elimination of "A" frame, reinforced blade, easy digging, enclosed operating cable, long-life cutting edges, easy blade adjustments, quick mounting, correctly grooved sheaves, long cable life, safe operation, fine visibility, high lift, low drop, straight or angling cut, unit manufacture, and one service source.

New Blasting Method

A NEW SYSTEM OF ROCK blasting promising increased tonnage, reduced secondary blasting and cleaner back break, is announced by Atlas Powder Co., Wilmington, Del. The blasting system called the "Rockmaster" system is the first Atlas postwar technical development for explosives users. The Rockmaster system is designed around an entirely new type of electric blasting device also named Rockmaster. The system requires changes in blasting procedure, such as spacing burden and the selection of the explosive for the particular rock formation. The new technique has been under field tests for several months and results indicate three very definite advantages all contributing to substantially increased efficiency in rock blasting.

In many quarries secondary blasting is of primary importance. The new system gives substantial reduction due to superior fragmentation. On one particularly difficult job six men had been employed to do secondary shooting. After the Rockmaster system was initiated two men were not kept busy.

The second benefit of the Rockmaster system is its reduction of what rock blasters call "back-break." Under this method a clean rock face is left after the blast, which reduces difficulty in drilling for subsequent blasts.

The third advantage is the minimizing of vibration from the blast—frequently a source of complaint from neighboring residents or plants. At one particular quarry complaints from neighbors because of vibrations necessitated the quarry company to reduce the number of holes. With the new system as many as 20 holes have been fired simultaneously without objectionable vibration.

With rapid postwar increases in stone production activity, operators are especially alert to improvements which enable them to bring out more stone at lower costs. The new method, which might be referred to as "geared blasting," pushes out the rock ready for the shovel when full buckets mean more rock produced.

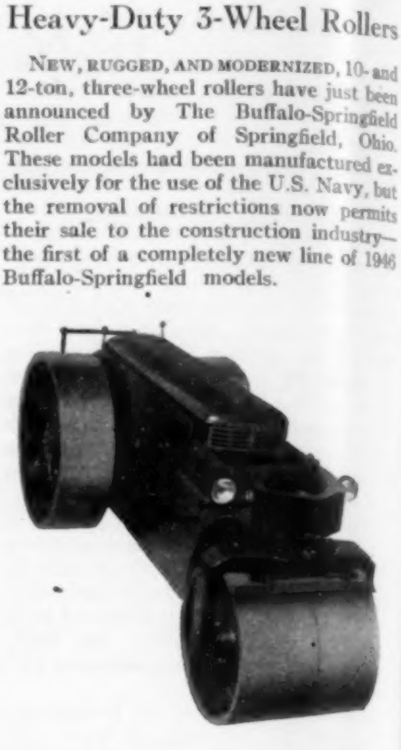
New "Athey" Trailer

ATHEY PRODUCTS CORP., 5631 West 65th St., Chicago, Ill., has announced the addition of a new rubber-tired unit, to be known as the PD-10 Trailer. This new two-way dump trailer is designed for use with the "Caterpillar" DW-10 Tractor for high-speed hauling on construction, mining, and other earthmoving projects. The PD-10 heavy-duty Trailer has a maximum capacity of 15 tons. It is engineered to take full advantage of the weight and power of the DW-10 Tractor.

The hydraulically controlled PD-10 has an approximate shipping weight of 15,000 lb. Its heaped capacity is 10 cu yd, and struck, 8 cu yd. In dimensions, the PD-10 Trailer alone is 21 ft long, 9 ft, 4 in. wide, 7 ft 2 in. high at rear, and 7 ft 10 in. high at front. It discharges its load from either side at a 55 degree angle. The unit is mounted on 1,400 × 20, 16-ply tires.

Heavy-Duty 3-Wheel Rollers

NEW, RUGGED, AND MODERNIZED, 10- and 12-ton, three-wheel rollers have just been announced by The Buffalo-Springfield Roller Company of Springfield, Ohio. These models had been manufactured exclusively for the use of the U.S. Navy, but the removal of restrictions now permits their sale to the construction industry—the first of a completely new line of 1946 Buffalo-Springfield models.



A new four-speed transmission, which provides a wide selection of speeds, is one of the several new features offered with these rollers. This transmission and bevel gear differential are enclosed in one accurately machined housing which is bolted to the engine to form a unit which is installed as a complete assembly in the roller. In addition to the transmission, differential, and engine, this assembly includes the radiator, fan assembly, and final drive pinions. These components can be serviced individually without removal from the frame. Other advantages are enclosed front-end and top-air intake for a cleaner engine compartment and a more efficient cooling system; readily accessible clutches; heavy, reinforced, all-welded steel channel frame; low-pressure hydraulic steering for effortless and instananeous operator control; roomy operator's station with all controls within easy reach of the operator; heavy-duty bearings throughout; simplified differential lock; all rolls cast from special analysis alloy iron which provides long wear without glazing; and a heavy-duty 6-cylinder gasoline or Diesel engine selected specifically for road roller service.

New Slide Rule

THE DECI.POINT Slide Rule which is the first one, it is stated by the manufacturer, to place the decimal point at the end of long and intricate computations, is announced by Pickett & Eckel, 53 W. Jackson Blvd., Chicago 4, Ill.

This rule is being manufactured of light-weight Dowmetal, surfaced with a flat white plastic that is said to be impervious to water or chemicals and virtually immune to abrasion from regular use. On this plastic, the scales are placed by a special process which insures accuracy and legibility. The Deci.Point Slide Rule is $12^{1}/_{8}$ in. long and 2 in. wide.

New Name for Caine Piling

Because the name Corrugated Steel Sheet Piling has caused some misunderstanding of its structural characteristics, the Caine Steel Co. has renamed the product, Caine Corr-Plate Steel Piling.

This piling is made by corrugating steel plates, and it is cold-rolled on special machines. This piling is now made in two types. The sections of the "Interlock" type are applied by raising them high enough above the completed section of piling, to hook in from the top. The "Standard" type is so arranged that the section being applied is hooked into welded clips from the side, making its use possible in places where there is low head room; or where there is unlimited head room, but the job is adaptable to application from the side.

Caine Corr-Plate Steel Piling is rolled and sold by Caine Steel Co., 1820 N. Central Ave., Chicago 39, Ill.

Two-Yard Scraper

One of the first postwar equipment units to be released by LaPlant-Choate Manufacturing Co., Inc., of Cedar Rapids, Iowa, is a small 2-yard front-dump scraper.

The new LaPlant-Choate Model CW-2 is a sturdy yet light little scraper weighing only 2550 lb. The two rear wheels can be located either inside or outside the cut and it can make a full 90° turn or less within a circle diameter of 20 ft. The hitch is designed for operation behind high-speed rubber-tired industrial tractors, such as the International Harvester Model I-4. When fully loaded, weight is lifted from the tractor's front wheels and much of the weight of the load is centered on the tractor's driving wheels for maximum traction. Bowl and apron are operated hydraulically. A three-position valve enables the cutting edge to be held in position and exert effective down pressure.

Other operating features include the ability to make cuts up to $11^1/_2$ in. and to produce smooth finished work. It can be loaded in all scraper material without the aid of a pusher, or loaded from overhead as there are no overhead structures to interfere. Due to low center of gravity the scraper will not roll over on any slope that will hold the tractor. Its rubber-tire equipment is designed for high road speeds but can be used on or off pavements. The bowl clearance and short wheel base allow its use on soft fills or rough terrain.

Literature Available

BAR SCREENS—Rex Mechanically Cleaned Bar Screens are described in a new 8-page booklet, No. 479. An explanation of what the machine is and how it operates, as well as a presentation of its exclusive features, is combined with typical job photographs and application drawings. A section of the brochure describes the Rex Triturator as used in conjunction with the bar screen. Data table and specifications are included. Chain Belt Co., 1600 W. Bruce St., Milwaukee 4, Wis.

BEARING ENGINEERING—A 270-page technical book entitled "Ball and Roller Bearing Engineering" has been published by SKF, Philadelphia, Pa., to serve as a fundamental text on all phases of bearing applications to industry.

The book, a bound volume containing some 900 drawings and tables, begins with a technical description of common bearing types. Both radial and thrust bearings are discussed comprehensively in Chapter I, with data on dimensional proportions, running accuracy and tolerances of each type. "Forces and Motions in Bearings," the second chapter, is devoted to theory and calculations on the nature of rolling resistance, friction torque, friction coefficients, stresses and deformations, load distribution, motion and inertia. Other chapters deal with studies in the carrying capacity of ball and roller bearings, bearing selection, design of bearing applications, mounting and dismounting, lubrication and maintenance and bearing failures. The final chapter is made up of tables, conversion values and a description of symbols and abbreviations.

COURSE IN WELDING—To provide a sound foundation in welding design and procedure, Lincoln Electric Co., 12818 Coit Road, Cleveland 1, Ohio, offers an intensive 5-day course in Welding Engineering. This popular course is intended primarily for designers, engineers, production supervisors, metallurgists, and instructors. Experienced and intelligent welders find the course of great value in furthering their arc-welding education; however, a college training or its equivalent in engineering experience is recommended for those attending. A 12-page folder, "Building Your Career in Arc Welding," gives further details.

MODERN GOVERNORS—A 24-page bulletin (B6356) on centralized control provided by modern governors for large hydro-electric units has just been released by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis. Fully illustrated with governor and related hydraulic-turbine equipment photographs, diagrams, and figures, the bulletin defines the functions of governors and describes set-ups for Francis, Kaplan, and Pelton turbines. Described in detail are Allis-Chalmers hydro-electric applications and governor arrangements at various outstanding power plants. The bulletin concludes with a discussion of "Governor Operation in Practice" and a "Comparison of Governor Characteristics."

pH and Chlorine Control—A completely revised edition of the Taylor combination handbook and catalog contains both simple and technical explanations of the meaning of pH control; specific discussions of the application of pH, chlorine and phosphate control to 35 industries; the precautions to be observed in making determinations; and descriptions of all Taylor outfits, including 8 new sets. W. A. Taylor & Co., 7300 York Road, Baltimore 4, Md.

Pipe Hangers—Conclusions of prefabricated power piping engineers regarding the design of piping layouts for flexibility have been published in a booklet entitled "Blaw-Knox Functional Spring Hangers and Vibration Eliminators," which may be obtained from the Blaw-Knox Co., Pittsburgh, Pa. The complete line of Blaw-Knox functional spring hangers complies in all respects to the requirements set up in pressure piping codes. The springs are totally enclosed and guided, and the assemblies are all of the same length and at the same elevation. They are easily adjusted and locked into position. The short headroom turnbuckle adjustment is $11^3/_8$ in. minimum for any load. The booklet gives many details concerning standard and special types and sizes of functional spring hangers and vibration eliminators, with instructions for their installation, and engineering information of value.

Steel Framing—Illustrated, 24-page catalog describing and picturing Stran-Steel nailable framing for light occupancy structures. Includes many examples of Stran-Steel framed buildings; latest joist loading and general properties tables, and isometric drawings of many construction details. Other Stran-Steel literature includes folders on complete all-steel Quonset buildings. Great Lakes Steel Corp., Stran-Steel Division, 3750 Penobscot Bldg., Detroit 26, Mich.

$20,000 Award Program—The rules and conditions for the James F. Lincoln Arc Welding Foundation award for textbooks covering machine and structural design for modern processes including welding are described in a 10-page booklet. The program closes May 15, 1946. James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio.

New Shoring Aids

Designed to reduce the cost and time of building shoring for concrete forms out of lumber, the Ray J. Moths Co., Inc., of Milwaukee, Wis., announces its tubular steel Trusses and Tee-Posts. Trusses are built sectionally, so that they can be quickly expanded or shortened for any need. Tee-Posts, which have a screw adjustment feature at the bottom, similar to an automobile jack, may be used in conjunction with the trusses, making them equally practical for floor and wall shoring, as well as beams and pilasters. This line of Trusses and Tee-Posts will soon be made available on a purchase or lease basis, through equipment dealers. Descriptive literature from the manufacturer.

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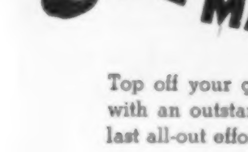

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and their advertising agencies

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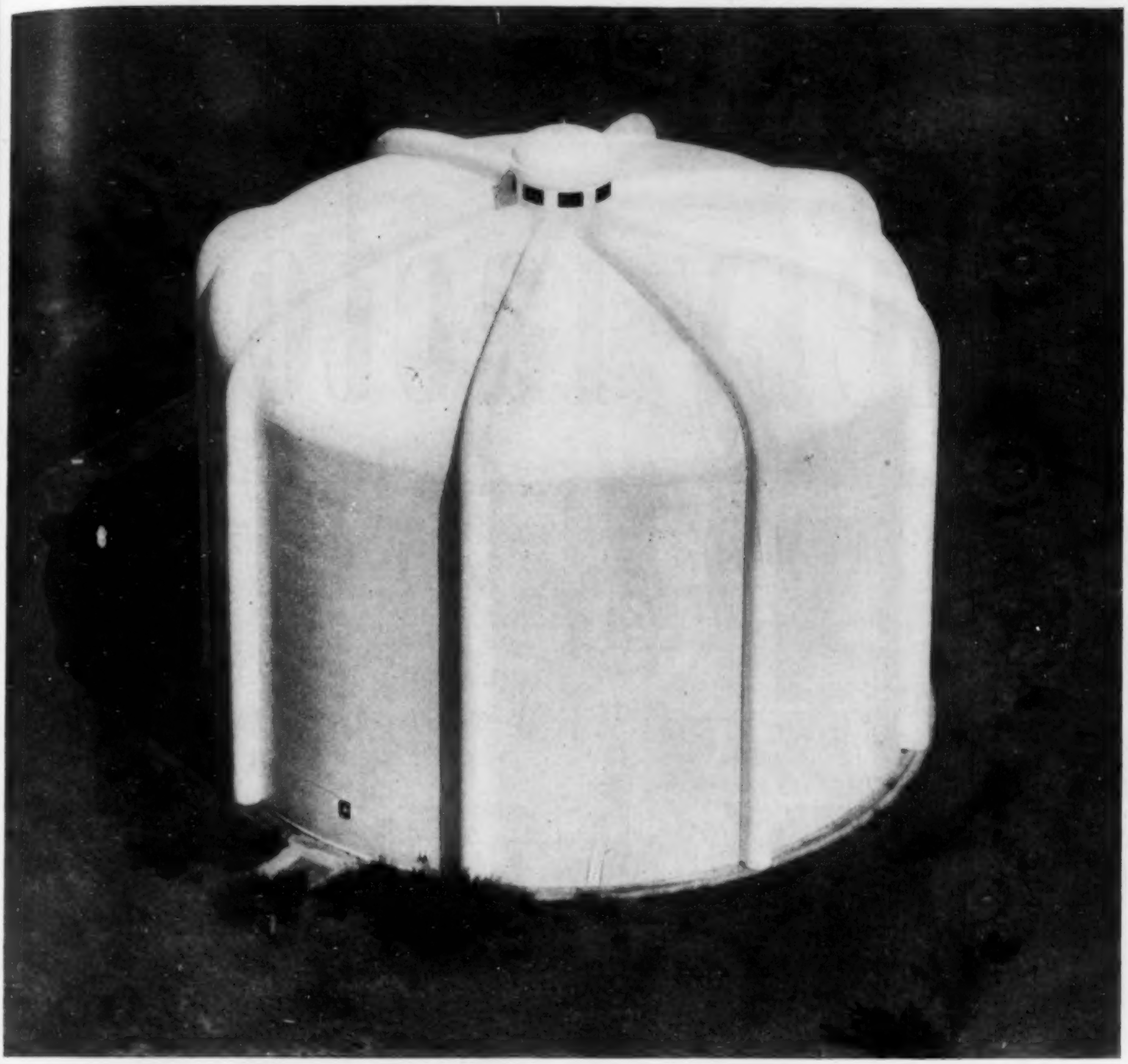

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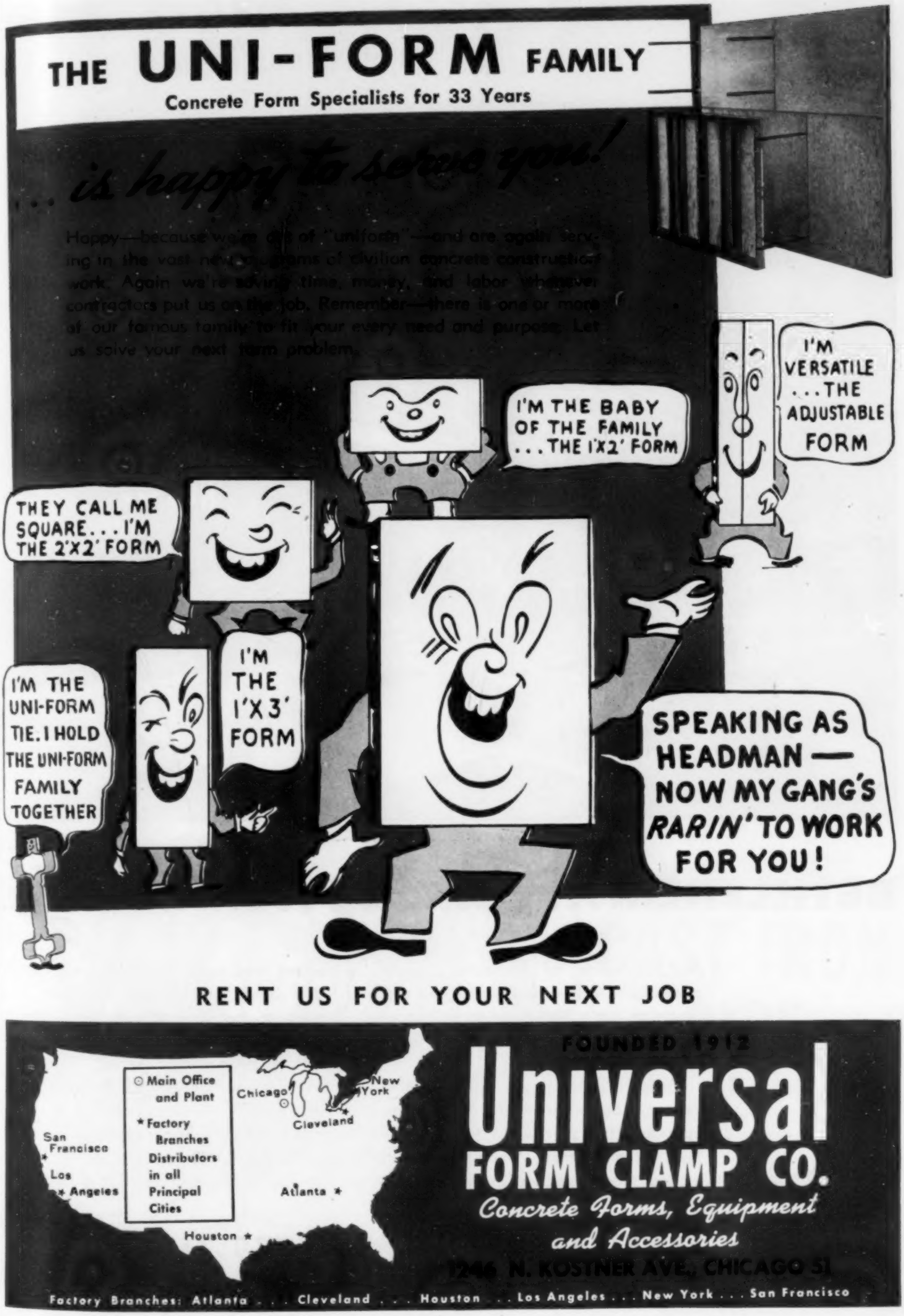
THE UNI-FORM FAMILY
Concrete Form Specialists for 33 Years
... is happy to serve you!
Happy—because we're out of "uniform"—and are again serving in the vast new programs of civilian concrete construction work. Again we're saving time, money, and labor wherever contractors put us on the job. Remember—there is one or more of our famous family to fit your every need and purpose. Let us solve your next form problem.
I'M THE BABY OF THE FAMILY ... THE 1'X2' FORM
I'M VERSATILE ... THE ADJUSTABLE FORM
THEY CALL ME SQUARE ... I'M THE 2'X2' FORM
I'M THE UNI-FORM TIE. I HOLD THE UNI-FORM FAMILY TOGETHER
I'M THE 1'X3' FORM
SPEAKING AS HEADMAN — NOW MY GANG'S RARIN' TO WORK FOR YOU!
RENT US FOR YOUR NEXT JOB
Main Office and Plant
Factory Branches
Distributors in all Principal Cities
San Francisco
Los Angeles
Chicago
Cleveland
New York
Atlanta
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FOUNDED 1912
Universal
FORM CLAMP CO.
Concrete Forms, Equipment and Accessories
1246 N. KOSTNER AVE., CHICAGO 51
Factory Branches: Atlanta ... Cleveland ... Houston ... Los Angeles ... New York ... San Francisco

Lithographed on stone by Edward A. Wilson

Cleveland fans are headed for two treats . . . a newly painted Municipal Stadium and a 4-hit victory pitched by "Rapid Robert" Feller.

treats . . .
and a 4-hit
Feller.